

PERFORATION OF THE STOMACH IN SIMPLE GASTRIC
ULCER: A RECORD OF SEVEN CASES: WITH RE-
REFERENCE CHIEFLY TO THE EARLIEST SYMPTOMS,
AND THE DIAGNOSIS.

A THESIS

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I N T R O D U C T O R Y

The subject of this paper was, not very long ago, rather summarily dealt with in lectures and textbooks, and the student or practitioner's attitude towards it was at once both hopeless and vague. The teaching of ten or eleven years ago was that one of the dangers of simple gastric ulcer was "death by perforation." The question of operation was suggested tentatively, as one which "might be entertained," although the "risk was great," the peritoneum not being considered so resistive in these cases, as in ovariectomy.

Today, it is not too much to say that it is an opprobrium, if, in any case of perforated gastric ulcer, the question of operation is not seriously discussed at the earliest possible moment, and, in the majority of cases, performed.

The diagnosis of perforation was, in past days, very lightly passed over. The details given were usually those of a stage in the sequential peritonitis, when the patient was in a hopeless state. The signs and symptoms of the actual occurrence, and the immediate physical condition, were never touched on. Slight though the reference was, to the condition, by the physicians, it was entirely ignored by the surgeons. The alteration in our

attitude today is striking, and encouraging. It has been effected by the advance of surgery, which, amidst many triumphs in the peritoneal cavity, has proved that the cleansing of the peritoneum of extravasated gastric contents, the suture of the perforation, with or without excision of the ulcer, the provision of peritoneal drainage if necessary, can be performed with a large measure of success. Yet in the text-books and standard works of ten to fifteen years ago, or even of more recent date, the description of perforation of gastric ulcer, its signs, symptoms, differential diagnosis, and treatment, is of meagre nature, and quite inadequate for present day need. This applies specially to perforation into the peritoneal cavity. The occurrence of perforation, while carefully recognised, was mostly considered as either the final fatal event in a case of gastric ulcer, or as one of the causes to be suspected in cases of acute peritonitis. Thus in the "Principles and Practice of Medicine," by Hilton Fagge (1886), cases are described, including one of much interest which recovered, only to die of a renewed attack four months later. Yet there is no detailed description from which a student might gain guidance in the immediate recognition of such cases. In the ques-

tion of treatment, there is no mention of operation whatever. With regard to prognosis in peritonitis he remarks (p. 245) "sometimes death is inevitable, particularly when the inflammation is set up by perforation of an ulcer in the stomach containing a considerable quantity of food." Again (p. 243), "In the whole range of therapeutics, there is nothing more important than the treatment of peritonitis of this kind, (set up by a perforating ulcer of the vermiform appendix or by any similar local affection)."

The therapeutic measures recommended were absolute rest, avoidance of purgatives and enemata, or of food by the stomach, and the administration of opium. There are, no doubt, cases in which such measures are sufficient, but in how many would such treatment be absolutely ineffectual, which to-day are saved by a timely operation.

In Quain's Dictionary of Medicine (1886) a short article is devoted to the subject of perforation, by S. Fenwick, in which the same treatment is recommended. The symptoms are more elaborately detailed, but in too general, and incomplete, a way, and most stress is laid on the sequential acute peritonitis. "Sudden severe pain in the abdomen, not necessarily referred to the region of the stomach,

it is said, "is quickly followed by retching and vomiting, and when the patient is seen by the practitioner, the symptoms of general peritonitis are present in a marked degree." This is too brief a description, and, in any case, is but a vague guide to the diagnosis of these cases, at the earliest stage. In differentiating perforation from colic, intestinal, biliary, or renal, stress is laid on the fact that in colic the pulse is slow, while in perforation it is rapid. This is not necessarily, not usually indeed, the case. The prognosis is summed up in the words, "almost always followed by fatal consequences."

In 1892 Ewald, in his "Diseases of the Digestive Organs," states that "peritonitis caused by perforation calls for the use of opium in large doses, either in the form of suppositories or enemata, together with the application of cold fomentations to the abdomen. If there is cause to suspect that the stomach is full, an attempt may be made to empty it by means of the tube .- . ." (p. 478)

With regard to the symptoms of perforation, he briefly remarks, "the patient feels sudden and violent pains in the body, under which he becomes collapsed, in a short time the symptoms of peritonitis are developed . . ." - a description

leaving almost untouched the diagnosis of perforation in the early stage, and hardly defining the matter clearly enough to practitioners who may never have seen a case of the kind, but who may be called to one at any time.

In Osler's "Principles and Practice of Medicine" (1894), we find that he speaks of the danger of an ulcer, on the anterior surface of the stomach, perforating, and causing "a diffuse and fatal peritonitis" (p. 369). "The symptoms are those of perforative peritonitis. In some instances the pain associated with perforation is not referred to the abdomen. In a case of H. C. Woods the chief symptoms were pain in the left shoulder, and excessive pain in the back on movement," (p. 372). This is practically all that is said about diagnosis, and of the treatment of the condition there is not a word under the heading of gastric ulcer, although it may be gathered from his remarks on acute peritonitis (p. 473) that the rest and opium treatment is recommended, and also, in all cases, a consultation with a surgeon.

However, in Allbutt's "System of Medicine," Vol. III, 1897, a far more satisfactory statement regarding perforation into the peritoneum, and various other sites, is given, under the chapter on

gastric ulcer, so that it is definitely included, with symptoms and signs, in the proper place, as a most necessary part of the practitioner's knowledge of the disease, while, under the head of treatment, the question of operation is fairly considered.

Again in Martin's "Functional and Organic Diseases of the Stomach," (1895) perforation into the peritoneal cavity, and subphrenic abscess, are fully treated, and reference will be further made to these writings.

In Hemmeter's "Diseases of the Stomach" (1898) the subject is dealt with much more confusedly, and no clear and concise arrangement is found, as in the case of Martin's and Allbutt's works. The immediate diagnosis of the perforation, and the treatment of it, are quite unsatisfactorily incomplete. In the index no mention is made of perforation at all, or its treatment.

In a work such as Hare's "Practical Diagnosis - The Use of Symptoms in the Diagnosis of Disease," 3rd Edition, 1898, prolonged search on the part of a practitioner, seeking aid in a case of the kind, would throw no light whatever on the question, despite the title and intended scope of the book.

It is interesting, for a moment, to turn to a discussion on the operative treatment of perforative

ulcer of the stomach and intestines, held in Bristol in 1894, at the meeting of the British Medical Association. Mr. Pearce Gould quotes there from Marion Sims, who spoke in 1881 at a similar discussion, thus; "Rest assured that the day will come - and it is not far off - when an accurate diagnosis in such cases, followed by prompt action, will save life, that must otherwise quickly ebb away." Mr. Gould then referred to a paper in the Bristol Medico-Chirurgical Journal of 1883, by Mr. Nelson Dobson, on a Fatal Case of Perforative Peritonitis, who had suggested then that "an attempt should be made to rescue such cases by a timely laparotomy." Mr. Gould congratulated Mr. Dobson that in 1894 "the first session of this section should be devoted to a discussion of the practical conduct of his suggestion. Mr. Dobson expressed himself as flattered by the reference made by Mr. Gould to his paper, which "suggested for the first time in writing, the possibility of operation in perforating ulcer of the stomach."

The whole discussion that followed is most interesting, especially the remarks of Gould, Maclaren, Barling, Haslam, and Franks. Nearly a year before this discussion Haslam communicated a very interesting paper to the British Medical Journal, November

11th 1893, much of which I am tempted to quote.

But at this stage let the present sentence suffice, as showing how he realised the necessity of the earliest possible recognition of the condition -

"It is therefore of the utmost possible importance that those engaged in general practice, under whose care such cases first come, should be keenly alive not only to the symptoms indicating so grave a peritoneal lesion, but to the necessity of taking immediate steps for its repair."

From this period, onwards, numbers of cases have been reported in medical literature, at home and abroad. The records of the cases are often deficient in clinical detail, which seems frequently to be sacrificed to discussion on the surgical procedure. Indeed, the cases are chiefly reported by surgeons.

My object is to define the position from the physician's point of view. The diagnosis, after all, is of primary importance - that is, the diagnosis at a time when the skill of the surgeon can save life, a time limited as a rule to not many hours. In the Lancet, March 2nd 1895, Jowers reported a successful case, and Paul in the same year, July 6th. In the Journal of the American Medical Association of January 25th 1896, Blume

contrasts the medical and surgical procedure of such cases. Kelynaek has a paper on "Pathological Considerations on Surgical Interference from Perforative Ulcer of the Stomach and Duodenum" in the British Medical Journal, October 22nd 1894. In November of the same year Bouchier Nicholson reports a successful case. (British Medical Journal).

Other cases are met with, and papers, too numerous to mention, though reference may specially be made to Affleck's paper in the Edinburgh Hospital Reports, Vol. II, p. 192, and to Leith's very important contribution following it, and a further long paper by the latter author, with very full references to literature, on "Complications in the Thorax (Inflammatory lesions of the Thoracic Contents) arising from Sub-diaphragmatic Conditions due to Gastric Ulcer," Vol. III, Ed. Reports, page 296-393, in which a great variety of obscure and anomalous cases are recorded, mostly bearing on the secondary consequences in the thorax of sub-phrenic abscess.

In Vol. IV of the Edinburgh Reports Lundie details an interesting case successfully operated on by him in private practice. Barker, in the Lancet of December 5th 1896 records a series of no

less than seven cases, of which three were successfully treated. It may be noted, in passing, that in all of these the perforation was on the anterior wall of the stomach. Morse (British Medical Journal, February 13th 1897) gives three cases, and two of them recovered, and Dr. Renton and myself reported two cases in the British Medical Journal of August 21st 1897. The "Annals of Surgery" take up the subject in November 1896, largely from the surgical point of view. So much, briefly, for the attention which has been recently bestowed in this direction.

My personal experience of perforated gastric ulcer, up to 1895, was nil, but in September of that year I met with a case, which, by the surgeon's aid, was brought to a perfectly successful issue - the first success of the kind, I rather think, in Glasgow. The late Professor Coats, in making some remarks on the case, when it was brought under discussion in the Medico-Chirurgical Society, said he was "pleased to see a beginning in this kind of treatment in Glasgow." Since that date, I have met with six more cases, two of which recovered, after operation: three died after operation: and one died on whom no operation was performed.

These seven cases I propose to recount in

this thesis, with a general consideration of the subject, gathered from my own experience, and the writings of others. The thesis does not deal with the etiology and pathology of gastric ulcer, but solely with the perforation, through the stomach wall, of such ulcer, the consequences of this, the early signs and symptoms of it, and the treatment generally, but not with any of the surgical details; attention being specially paid to perforation into the peritoneal cavity, as my own cases have been, with one exception, confined to that variety.

P R E L I M I N A R Y

It might be well to pass in review, here, the varying conditions and consequences of perforation, before detailing my cases, which exemplify a few, only, of its phases.

Perforation of the stomach gives rise to a very great variety of symptoms, and to a class of cases of which hardly one can be just like another; not from any constitutional variations, which help to determine differences in type in other diseases, but from local and anatomical conditions, of which the following, as influencing the nature, and course, of any case, may be noted:-

1. The position of the gastric ulcer, whether it be at the cardiac, or pyloric, extremity of the organ: or on the main body of it: and whether on the anterior or posterior surface.
2. The presence of adhesions, in the neighbourhood of the ulcer, to adjacent organs, or tissues.
3. The mode of rupture of the ulcer, whether complete, and unconfined: or gradual, and limited by adhesions.
4. The condition of the stomach at the time of rupture: whether empty: or more or less distended by food or gas.

There are several consequences of rupture of gastric ulcer, determined by the above-mentioned conditions (local states, and natural, or acquired, anatomical relations), as follows:-

- a. Rupture into the free peritoneal cavity, followed by general acute septic peritonitis.
- b. Rupture between the diaphragm and stomach, resulting in sub-phrenic abscess.
- c. Rupture into a space limited by peritoneal adhesions, forming a localised peritoneal abscess, other than sub-phrenic.
- d. Rupture without, or with very slight, extravasation, causing localised perigastric peritonitis, followed by adhesions, and not by abscess formation.
- e. Rupture into a hollow viscus, or a solid organ after adhesion to it.

While in the present paper, I am chiefly concerned with perforation into the peritoneal cavity,

and the onset of peritonitis (though one case of sub-phrenic abscess brought under my notice is recorded) it is obvious, from what has been said above, that the rupture of a gastric ulcer may occasion many diseased conditions, of great interest: and to these, to make the general aspect of the subject more complete, I will make, just now, some further brief reference, and to other topics of importance connected therewith. Perforation may occur into the pleural cavity, causing a purulent and gaseous empyema - pyo-pneumo-thorax - or if adhesion so cause it, a pulmonary abscess, with destruction of lung tissue.

Similarly, cases have been recorded where the pericardial sac, and even the heart, have been perforated. Dreschfeld mentions perforation into the mediastinum, "an extremely rare occurrence - interstitial emphysema may arise, and if death do not quickly ensue, mediastinal abscess may follow." (Allbutt's System, Vol. III, Gastric Ulcer.)

Apart also from adhesions to the anterior abdominal wall: to the omentum: liver: and pancreas: and abscess formation: and extension of the abscess in new directions, according to the situation, frequently giving rise to obscure signs and symptoms, and making diagnosis difficult, there

are records scattered in literature, and referred to by many authorities, of perforation into the gall bladder: and into the bowels, especially the transverse colon, causing the formation of what is known as a bi-mucous fistula. While beyond the scope of my paper, at present, to consider these cases, I must refer again to Leith's exhaustive contribution in Vol. III of the Edinburgh Hospital Reports (p. 296) and will quote this passage from him. "We frequently observe that diseases which involve the structures and organs of the abdominal cavity, especially in its upper part, come in the course of their development to implicate thoracic structures. The thoracic symptoms and signs may indeed be the first to attract the attention of the physician, and the case may be treated throughout as one of pleurisy, empyema, pneumo-thorax, or pneumonia, without any suspicion of its true nature. Such cases are frequently obscure, and run a somewhat erratic course. Their true pathology may be disclosed only at the post-mortem examination. Physicians ought always to be suspicious of cases of intrapleural effusion or lung inflammation with an exclusion or pronounced abdominal history. Leyden indeed says that, if in a patient with symptoms of effusion in the thoracic cavity,

"there has never been, during, or at least not in the beginning of, the disease, any cough or other signs indicating trouble in the supra-phrenic cavity, and if, on the other hand, the present ailment was preceded by disturbances in the abdominal organs, we are justified in diagnosing the effusion as a sub-phrenic abscess."

So far as the situation of the ulcer bears upon perforation of it, it might be well to mention a few figures, and facts, of interest, before passing to the details of cases. In about six or seven per cent. of cases of gastric ulcer death is said to be caused by perforation. About two per cent. of ulcers situated posteriorly perforate, but of those on the anterior surface about 84 - 86 per cent. do so. The anterior situation, however, is much less common than the posterior, fortunately so. Martin says (loc.cit.) "By far the larger number of ulcers are found on the posterior surface of the organ, and on the smaller curve, and more than three fourths of the ulcers are found in the pyloric portion of the stomach." While, therefore, the posterior position of an ulcer is most favourable for the patient, as perforation occurs far less seldom than in anterior ulcer, it is much less favourable surgically, if perforation do

occur, as it increases greatly the surgical difficulties, and fewer patients of that class recover. Unfortunately, we cannot yet tell, from the symptoms, either of the ulcer before perforation, or of the perforation itself, whether the ulcer be anterior, or posterior: though we are able more clearly to define its probable situation in the stomach, as regards being pyloric, cardiac, or no. When the surgeon deals with a case he cannot tell what difficulties may have to be encountered till the abdomen is opened.

Kelynack divides perforating ulcers (British Medical Journal, Vol. II, 1894, p. 914) into (1) gastric, (2) pyloric, (3) duodenal, and continues, "Ulcer of the stomach has usually been stated to be most frequently met with in the posterior wall, near the pylorus, and towards the lesser curvature. The position, however, varies considerably: and yet to the surgeon it is the factor which, above all others, is of the greatest moment. For him there are but three positions:-

1. Accessible, where the ulcer may be readily found, and easily dealt with.
2. Non-Accessible, where the ulcer is both out of sight, and out of reach; and
3. Difficult, where it is more or less get-at-able, but possibly only after much search, and where, frequently, efforts at closure are rendered arduous and perplexing."

Marshall also makes a clear (British Medical Journal, November 11th 1893) and very practical classification which it is instructive to quote:-

"1. Where no adhesions whatever have formed round the base of the ulcer, so that the contents of the organ pass freely, and at once, into the peritoneal cavity: or where, if any adhesions have formed, these are so slight that they readily give way, producing a similar result. In these cases the perforation is usually found on some part of the anterior surface of the stomach.

2. Where adhesions have formed between the stomach and some adjacent organ: these adhesions may have formed before any perforation has occurred, or, when the stomach is in close contact with some other organ, the leakage due to perforation may be so gradual, that time is allowed for adhesions to form, and protect the general peritoneal cavity. In either case a localised peritonitis will be set up, and any resulting suppuration will be shut off from the rest of the peritoneum. In these cases the perforation is more commonly met with at the posterior surface of the stomach, where its relations to adjacent parts are more intimate than on the anterior surface.

3. Those rarer cases where adhesions form

between the stomach and some hollow viscus, or serous cavity, and perforation opens, for instance, the colon, the pleura, or pericardium."

I now proceed to the third division, the consideration of clinical material, taking up the cases in the sequence in which they occurred in my practice.

C L I N I C A L

CASE I.

Miss A. B. aet. 26. September 23rd 1895.

On the afternoon of September 23rd, I received an urgent summons to see this patient, hitherto unknown to me. I was told that she was suffering from severe pain, and was faint. Her illness had come on quite suddenly, it was stated, shortly after she had climbed a high stair to her dress-maker's room. She had then been seized with severe pain in the abdomen, which continued. She had sunk to the ground unable hardly to speak or move, and had been lifted on to a bed, and undressed. Brief enquiries into her past history revealed a vague history of dyspepsia, with occasional gastric pains, worse of late. The patient

I found unable to speak, or give any account of herself. But, I may say, that while she was convalescing, the details of her former digestive and general history pointed to the likelihood of ulcer having been present for some time, but otherwise to good health.

EXAMINATION: I saw her about $1\frac{1}{2}$ hours after the sudden pain had occurred. Shock was not present to any extent, though she was suffering greatly. The pulse was 96, full, and of fair tension. The temperature in the axilla was 98° Fah. She was only able to say that she had felt squeamish, and had had a curious internal sensation of something very serious having happened to her. She exhibited great control over herself, and lay very still, with her eyes closed, as any movement increased the pain. This pain was referred to the abdomen, but also very specially to the whole anterior surface of the thorax, to the root of the neck, especially on the left side, and to the scapular regions, and upper part of the dorsum. There was distinct tenderness in the abdomen, perhaps specially across the epigastrium, and down the ascending colon, towards the right iliac fossa. There was a very marked board-like feeling of the parietes, which were

retracted.

The liver dulness extended from the costal margin in the nipple line for $3\frac{1}{2}$ inches upwards. The chest was long and narrow, and presumably the lungs overlapped the liver somewhat more than usual. At anyrate there was no evidence of free gas in the peritoneal cavity, so far as the condition of the liver dulness was evidence. But the percussion note immediately below the costal margin was extremely tympanitic - remarkably so.

While watching the case, and waiting for surgical consultation, it was noted that the abdominal pain diffused itself rapidly till it was general, and that the pain in the thoracic regions indicated was as great as ever. She became also somewhat collapsed, and three or four hours after the onset of her illness, the pulse was 130, and the temperature 103° . The abdomen, however, was still retracted.

It may be further noted that, all through, the respirations were costal in character. Also that she had eaten nothing for four hours before the attack. She did not show, even a little later, any specially pinched abdominal facies. Morphine, $1/3$ rd grain, hypodermically, had no

effect in relieving the pain.

After consultation with Drs. Snodgrass and Dalziell, and agreement that acute peritonitis was present in the earliest stage, caused by the rupture of the stomach in most likelihood, though other possibilities were entertained, she was removed to a nursing home, and within about five to six hours after the initial attack, her abdomen was opened, and a perforated gastric ulcer found, in the anterior wall of the stomach, close to the pylorus, with a quantity of turbid yellow effusion in the peritoneal cavity. The aperture was about a quarter inch in diameter, and the margins were thickened, indicating, apparently, an ulcer of some standing. The contents of the stomach were found mostly on the right side of the abdomen, and in the pelvis. Dr. Dalziell had charge of the patient from this point, and it was gratifying to all to find that the operation carried out, and the after-treatment resulted in a complete restoration of the girl to health. I heard of her more than a year later as able to eat ordinary food, and in good condition.

This case was detailed before the Glasgow Medico-Chirurgical Society, from the "Transactions"

of which I may now quote some of the remarks I made at the time on one or two of its features:-
(Transactions Vol. I, p. 48)

"1. The Behaviour of the Liver Dulness: In
"cases of suspected perforation of an air-contain-
"ing viscus in the abdomen, there may be alteration
"in the liver dulness, as is well known, from com-
"plete, to partial, obliteration of it, its place
"being taken by a tympanitic note. It was not
"so in this case. Absolute dulness was found
"along the right costal margin, and extended up-
"wards to nearly the normal extent. I observed,
"however, that while the abdomen (one hour and a
"half after the sudden onset of the illness) seemed
"then remarkably flat, the percussion note just below
"the liver dulness was highly resonant - more so,
"in fact, than the flatness of the abdomen, and ap-
"parent absence of any amount of gas in the intes-
"tines, would have led one to expect. The dis-
"tinction, however, was a fine one, but this point,
"viz. the quality of the percussion note relative
"to the apparent state of the intestines, is worth
"noting, and might, in other cases, be more sug-
"gestive in forming a diagnosis. The main point,
"however, which this case illustrates, is, that as
"regards the alteration of liver dulness, we cannot,

"as is well known, from the absence of any such
 "alteration, exclude the possibility of the per-
 "foration of an air-containing viscus: while,
 "on the other hand, the positive affirmation of
 "the characteristic alteration is of the greatest
 "value, in the very early stages of the case, be-
 "fore tympanitic distension has set in.

"2. The Distribution of the Pain: I omit
 "reference to the abdominal pain altogether. I
 "was struck at the time with the complaint of pain,
 "marked and emphatic complaint, in practically the
 "whole thorax in front, and especially in the
 "clavicular and supra-clavicular regions, and
 "also in the scapular region and back. At the
 "time, the explanation did not occur to me, and I
 "was inclined to pass over a symptom which seemed
 "to confuse the diagnosis, whereas, I believe, ac-
 "curate interpretation of it would have strengthened
 "the diagnosis eventually arrived at. The obvious
 "explanation is that these pains were 'referred
 "pains,' and the connections of the splanchnic
 "nerves with the lower six intercostal nerves
 "through the dorsal sympathetic ganglia, and in
 "the spinal segments, need only be mentioned to
 "indicate the reason of the pain in the lower six
 "intercostal spaces. In the same way the clavicu-

"lar, and supraclavicular, pains are explained when
 "we recollect the relations that exist between the
 "phrenic nerves, and the descending superficial
 "cutaneous branches of the cervical plexus, the
 "latter coming from the fourth cervical, the
 "phrenic from the fourth and fifth. The violent
 "irritation of the upper abdominal zone, by the
 "escape of stomach contents, so energetically
 "stimulated the terminal phrenic filaments, that
 "an overflow of stimulus centrally was referred to
 "the cutaneous positions indicated. In future
 "cases the presence of this pain might well be
 "included as a minor strengthening factor - rather
 "than as it was with me at the time, a disturbing
 "one - in arriving at a diagnosis."

In the discussion that followed upon the
 case Dr. Middleton remarked that (loc. cit. p. 50)
 "the success was largely contributed to by the
 "speed with which the diagnosis had been made.
 "He had been interested by the remarks of Dr. Adamson
 "on the symptoms of gastric rupture, but he thought
 "that, in those cases which survived the accident
 "for some time, the symptoms were not always such as
 "could be relied on in the way of diagnosis. In
 "this connection he referred to a case which had
 "been recently sent into his wards as one of left

"basal pleuro-pneumonia with peritonitis, a diagnosis that he had confirmed. In that case, as time went on, the pleuro-pulmonary signs seemed to spread upwards, and even to the right side, and pericarditis also was suspected, while the peritoneal signs gradually concentrated themselves in the right iliac region. The girl died after ten days' illness, and examination revealed a large sub-diaphragmatic abscess, arising from perforation of a gastric ulcer, of which no history could be obtained. There was no pericarditis, no pneumonia, and only a trace of pleurisy. In addition there was a large abscess in the right iliac region, without any connecting channel between the two abscesses."

Dr. Renton, also, said that in cases of rupture of the stomach "the patient when seen is usually collapsed, and the feeling against operation is great. He had seen three cases of rupture of the stomach where operation was recommended, but not accepted. He was pleased with Dr. Adamson's explanation of the pain, but the same pain sometimes occurred in intense flatulence. Such a case he had seen with the late Dr. Leishman, who relieved the condition by passing a trocar."

Dr. Newman said "perforation of the stomach

"was a condition most disastrous in its results unless recognised at once and promptly treated by immediate suture. Dr. Dalziel was to be congratulated on the successful result of his treatment, which was doubtless due to the rapid diagnosis and to the promptitude with which the operation was performed. In most of the cases of perforating ulcer of the stomach which he had seen, the ulcer was situated at the pyloric end, and on the posterior wall of the viscus, and was therefore readily accessible by an incision in the middle line. . . . In some instances, even after leakage of the gastric contents, the perforation may become sealed by glueing of the stomach to neighbouring parts, and so the symptoms of general peritonitis may be masked and indefinite. . . . The number of cases of recovery of ruptured gastric ulcer in which, after laparotomy, the perforation was found and sutured, were few. Mr. W. H. Bennett, London; Mr. J. H. Morse, Norwich; and Mr. Jowers of Brighton, had published successful cases. Dr. Kriege also records a case of recovery where seventeen hours elapsed between the onset of symptoms of perforation and the operation."

In closing the discussion the late Dr. Coats said that "In several cases he had found on post-

"mortem examination a perforation of the stomach
"which apparently might have been successfully
"treated by surgical measures. The symptoms, with
"the exception of the initial shock, do not arise
"from the perforation, but from the irritation pro-
"duced by the escaped contents of the stomach, and
"as these gravitate towards the lower abdomen, it
"is here, rather than in the gastric region, that
"pain, tenderness, and other symptoms are to be
"expected."

CASE II.

Miss C. D., aet. 25.

On the night of November 7th 1896, I was called to see a domestic servant, who complained of sudden and severe abdominal pain. She was lying on her back in bed, with her knees slightly drawn up, her complexion pallid, with an anxious expression. She was perfectly conscious, and stated that the pain was on the left side of the abdomen, at the level of the umbilicus.

On inquiring into her past health, she was found to have often suffered from indigestion, characterised by pain after food. She had never vomited so far as she recollected, and certainly never had vomited blood. She had felt pain in the

stomach that day, and especially at 8.30 p.m. after having partaken of steak, bread, and tea. At 10 p.m. she was suddenly seized with a violent pain in the abdomen, situated at the normal level of the lower curvature of the stomach. The pain gradually increased, but there was no vomiting or feeling of sickness.

When I saw her - at 10.15 p.m. - in addition to the above, she pointed to one specially tender spot just below the arch of the left ribs, and midway between the middle line and the side, where the pain was particularly intense, and she also complained of pain in the region of the left clavicle, passing up her neck. There was no pain elsewhere in the thorax, nor in the lower abdominal region.

The pulse was 96. The temperature 98.4. She looked more faint and collapsed than her pulse indicated, and her lips were slightly cyanotic.

The abdomen was flat, and on palpation a marked board-like rigidity extended all over it. There was pain on pressure over the lower part of the normal stomach region, and one specially tender spot, but no tenderness on pressure in the iliac regions.

The liver dulness was absent in the middle line, as also for an inch and a half from the costal margin on the nipple line. On auscultation over the stomach, a bell-like tinkling sound was heard at intervals, sometimes noticeably synchronous with the heart's action, sometimes with the respiration. Air and gas were clearly being churned together in the stomach, bowel, or peritoneal cavity.

The whole history of the case pointed to commencing peritonitis due to rupture of a gastric ulcer, so I insisted on her immediate removal to the Western Infirmary, in spite of considerable opposition on the part of her friends, who did not think her sufficiently ill to go there. On arriving at the Western Infirmary shortly after midnight, and while being conveyed to bed, she complained of the intensity of the pain above both clavicles.

The chief factors in the diagnosis of this case, were, first, the mode of onset of her symptoms; secondly, the physical signs presented by the abdomen; and, thirdly, the former gastric pain during the early stages of digestion.

A few remarks may be further made here on:-

1. The Shock; which was slight, and quickly passed off. Just before she was carried up to

the ambulance waggon, she sat up in bed and said she felt much better, and objected rather strongly to making a journey at that time of night.

2. The Condition of the Abdomen: The board-like rigidity was the most marked feature in the case, and having noticed an exactly similar state in the first case (that of A. B.) it seemed strongly to support the diagnosis. The behaviour of the liver dulness suggested the presence of gas in the peritoneal cavity. The absence of alteration in the normal dulness would not necessarily have indicated absence of rupture, as in the case of A. B. there was a ruptured ulcer with normal liver dulness. The presence of the alteration, however, more especially in the earlier stages of the case, lead to a strong suspicion that there was a rupture.

3. The Tinkling Bell-like Sound: There was obviously room for fallacy here, still the sound was a short, sharp tinkle, similar to the sound heard in pyo-pneumo-thorax. I was satisfied it was due to the escape of gas and fluid through the perforation, these receiving vibrations through the beat of the heart, or the movements of the diaphragm in respiration. In the third case to be detailed, I had the opportunity of listening to similar sounds, only so much louder as to be audible at some distance

from the patient.

4. Pain above the Clavicles is worthy of note. In the first case (A. B.) the same pain was present, only more extensively. In that case I felt that the pain above the clavicles might in future be included as a minor strengthening factor in arriving at a diagnosis - and so it did prove to be in this second case.

The patient, as I have said, was received into the Western Infirmary, into the wards of Dr. J. Crawford Renton, and though then out of my hands, I may follow up the history of her case briefly by quoting Dr. Renton's remarks. (British Medical Journal, August 21st 1897.) "On the evening of "November 7th 1896, I saw at the Western Infirmary "C. D., suffering from symptoms of a perforated "gastric ulcer. There was considerable shock, "pulse 120, pain and moderate abdominal distension, "with superficial gurgling over the upper abdominal "region on stethoscopic examination.

"There was pain in the neck and ears, and the "liver dulness was diminished. With these symp- "toms present, I advised that the abdomen should "be opened. On dividing the peritoneum, a small "amount of gas escaped, and on introducing my "fingers I felt the depression in the stomach

"which indicated a gastric ulcer, and on drawing it
 "outside, the ragged rupture was easily seen on the
 "anterior surface. The edges were pared, and a
 "double row of silk sutures introduced. The
 "abdominal cavity was now cleansed, the fluid
 "being sponged out, and the cavity washed with
 "corrosive sublimate solution, 1 in 6,000, and as
 "no collection of fluid was found in Douglas's space
 "a second opening was deemed unnecessary. The
 "wound was closed, a glass drainage tube being
 "retained at its lower angle. The patient rallied
 "from the shock, and was fed by the rectum for
 "twenty-four hours, and then by the stomach, get-
 "ting, however, only barley water, soups, and
 "limited stimulant for a week, until we might be
 "sure that the wound was closed. The glass tube
 "was removed in forty-eight hours, and the wound
 "healed well. . . . The patient is now
 "quite well, and able to enjoy food like other peo-
 "ple."

CASE III.

Miss E. F., aet. 23 years.

This patient was seen a few months after the
 one recorded above - just prior to her removal to

a nursing home, as an operation was to be performed, in the view that she was suffering from a recent perforation of a gastric ulcer. Four days before she had had abdominal pain, and pain in the left side, which however passed off, and to the physician in attendance, good progress was apparently being made.

There was nothing in her previous history, or the course of her illness at the time, to suggest the presence of a dangerous condition. She had got out of bed, and was moving about a little, though still on strict diet. She had then been seized with recurrence of very severe abdominal pain, and collapse. The most remarkable feature about the case, in which I was only able to carry out a very hurried and incomplete examination, as the responsibility did not rest with me, and the operation was impending, was an extraordinary splashing, tinkling sound, heard over the stomach region in front, and also laterally on the left side. This at times could be heard by the unaided ear while standing beside the patient. On examining the chest in the lateral region, at the level of the seventh, eighth and ninth ribs, the percussion note was peculiarly resonant, and the breath sounds heard there were amphoric almost

in character. I was inclined to think that possibly the lesion was above the diaphragm, and of the nature of a pyo-pneumo-thorax. This seemed the more probable after laparotomy had been performed, and no perforated ulcer of the stomach detected. Exploration of the region, with an aspirator, where the physical signs were most marked, was carried out next day, without result. The patient gradually sank, and died, with septic symptoms. The case was cleared up at a post-mortem examination which disclosed a sub-phrenic abscess far up on the left side, at the cardiac end of the stomach - almost impossible to be reached from a median incision.

Though the details of this case are, of necessity, meagre, as I only saw the case through the courtesy of a friend, it is fairly typical of sub-phrenic abscess, - numerous most interesting cases of which have been reported in literature of recent years.

One case of what I considered to be threatened rupture at the cardiac end, and formation of sub-phrenic abscess, may be briefly referred to here, in parenthesis, as illustrative of the point in Case III, when the patient, after treatment for

severe pain, was permitted to get up and move about, and take a little more food.

A domestic servant in my own house was, briefly, a typical subject for the occurrence of haematemesis or perforation: for long-standing indigestion had from time to time been evidently complicated with ulceration, and she had certainly on one occasion vomited blood. Nothing, however, would induce her to continue treatment for any sufficient time, not even the pretty severe gastric pain she at intervals suffered from. One night, however, she came home suffering agonising pain in the left hypochondriac region, which had come on quite suddenly about an hour previously. The pulse was slightly quickened: the temperature was just slightly raised. The pain "stabbed" her worse when she breathed, or moved, while constant even at rest.

Examination of the abdomen revealed nothing beyond some rigidity of the muscles under the left costal arch. Neither did examination of the thorax discover any pleural or pulmonary lesion.

Morphia was given hypodermically, and relieved the pain greatly. My opinion was that a chronic ulcer, possibly adherent to the diaphragm

had given way slightly, without the escape at least of any quantity of gastric contents, so that a local peritonitis had arisen, which, with care, would subside, and so far as the weak spot at that part of the stomach was concerned, would probably prove beneficial, by the formation of fresh and stronger adhesions.

In a nursing home she was treated at first by rectal alimentation, and later, by appropriate diet and medicines, for between two and three weeks, then insisted on going home to the country, where she followed out faithfully, I believe, all the advice given to her regarding diet and rest. At any rate the result was satisfactory, as I saw her two years afterwards in perfect health.

CASE IV.

Miss C. K., aet. 22 years.

On November 13th 1897, I was urgently called to see this patient, a domestic servant. I found her complaining of severe pain in the epigastrium, with a feeling of sickness, and depression. The duration of this illness was three quarters of an hour. She was previously known to me as a particularly tall, well-made, healthy looking girl.

She told me that about three quarters of an hour before, she was seized with a quite sudden, acute pain in the pit of the stomach, when walking along the street. It made her feel very weak, and faint, and she had to go into a shop to rest. She did not vomit, or lose consciousness, but felt very ill. She was taken home in a cab, suffering severely.

Previous Health: For the past two or three weeks she had had indigestion, characterised by pain shortly after food, about a quarter of an hour or less. It had not been very severe, and she had done nothing for it, either in the way of medicine or diet. On the afternoon of the 13th, she felt this pain after dinner of Irish stew and vegetables. It was not more severe than usual. Two years before she had similar indigestion, with pain shortly after food, and breathlessness, and had then been long under medical care, eventually recovering satisfactorily. Neither then, nor lately, had she vomited blood, nor had she ever known that she had ulceration of the stomach. She had not recently been vomiting at all, and had noticed nothing peculiar about her motions. Her menstruation had always been regular, and was taking place at the time I saw her.

Present Condition: The pain was evidently very distressing. The pulse was about 90, soft, suggestion of faintness. The temperature was 98°. The face was pale, and the expression that of marked suffering.

On examining the abdomen it was not found particularly hard at any part, though somewhat resistant. There was some fulness in the lower region, but she did not think it more than natural, being a stout, well nourished girl.

There was distinct pain on pressure in the epigastric region, and downwards towards the umbilicus. There was no pain or tenderness below the umbilicus, and no pain at all in the thorax, or neck, or back.

The Liver Dulness, though not present in the middle line, was found about one inch above the costal margin in the nipple line, and extended upwards to the normal limit. She was extremely restless, and the examination, thus made rather difficult, was interrupted by violent sickness, a great amount of undigested food being ejected, in which carrots, turnips, and onions were visible in large pieces. The last meal had been taken about five hours previously. There was great pain during the sickness, but afterwards she felt relieved.

Though the possibility of gastric perforation

was present to my mind, I thought that all this undigested food and vomiting might well account for the pain, and the distressed appearance of the patient: and she seemed temporarily somewhat relieved. There was no typical abdominal rigidity, and the liver dulness, though not absolutely normal, was not more altered than in other cases I had noted it to be, when no question of the perforation of a viscus arose. I was strongly suspicious, but resolved to see her soon again, prescribing at the time an antacid and sedative draught, with the application of warmth to the abdomen. I saw her again at 11.30 p.m., and found her quite unrelieved. She was sitting half up in bed, and her face looked pallid and pinched, and her lips blueish, and the eyes sunken. She struck me as being seriously ill.

On examining again the abdomen I found some further swelling towards the lower part, and very great tenderness on pressure all over the epigastric and umbilical regions, lower down and further to the sides than formerly.

The walls of the abdomen, though by no means absolutely rigid, were distinctly more so than before, and offered considerable resistance to palpation. The considerable amount of fat in them

possibly marked the extent of the rigidity actually present. The pain in the abdomen was relieved by raising the knees.

The Respiration was noted to be entirely thoracic in character, quick and shallow, the abdominal walls remaining quite motionless. There was pain felt in the upper part of the abdomen if deeper breaths were taken.

It was now noted that the liver dulness was distinctly abnormal. As before, there was none found on percussion in the middle line, and in the nipple line a resonant note replaced the normal dull one for $3\frac{1}{2}$ inches upwards from the costal region.

On applying the ear to the abdomen a distinct tinkling sound was occasionally heard, but very faint, and inconclusive in its character, very different from the peculiar bell-like sounds heard in former cases. The pulse was now 96, and the temperature still 98° . There was no pain whatever in the neck or shoulders.

The purely thoracic character of the respiration, with the tenderness spreading over the abdomen, and especially the alteration now noticed in the liver dulness, which there was no sufficient distension of the abdomen to account for, along with the appearance of considerable shock, pointed to

the presence of commencing acute peritonitis, from the rupture of an air-containing viscus: and the situation of the original pain, its abrupt onset, with the former history of gastric indigestion, pointed to the stomach as the ruptured organ.

So she was at once removed to the Western Infirmary in an ambulance waggon, and admitted to Dr. Crauford Renton's wards. At 1.30 a.m. Dr. Renton having seen her, and concurring in the diagnosis, opened the abdomen in the middle line, between the umbilicus and the xiphisternum. An abundance of turbid fluid at once presented itself, and gushed out in large quantity. For some time the site of the perforation eluded search, but was ultimately found at the posterior aspect of the stomach, near the lesser curvature, towards the pyloric end, partially concealed by an adhesion. The perforation was small and circular, in the centre of a congested area the size of a shilling. It was situated high up, under the liver. Flakes of lymph were present over the neighbouring peritoneum. I need not enter upon the further operative details, which were successfully carried out. On the whole she bore the operation remarkably well, but peritonitis unfortunately caused death three days later. Evidence of this was found at

the post-mortem examination, which disclosed the recent perforation securely stitched, and the cicatrix of a former ulcer on the anterior wall. The chief diagnostic points in this case have been emphasised in passing: but I may say again, that in this case, as in the former ones, the most suggestive facts are likely to be obtained in:-

1. The past history of the patient's digestive functions, which may, although it may not, indicate former gastric ulcer.
2. The mode of onset of the illness, in quite sudden severe pain, or possibly in great exacerbation of mere "indigestion" pain, causing varying degree of collapse, and continuing in severity, and increasing in extent.
3. Coming to the strictly clinical signs - the diffused tenderness of the abdomen: the rigidity of its walls, so remarkably present in two of the former cases, though not nearly so evident in the present instance: and the absence of abdominal restriction: and
4. The alteration in the liver dulness, the most valuable sign, when present, of all.

In contra-distinction to the former cases, I would mention that in this one the signs were not characteristically developed three-quarters of an hour after perforation, but that within five hours they were comparatively easy to recognise. That, further, there was at no time reference to pain in the neck or shoulders, which was a prominent

symptom in former experiences: that the tinkling sound in the abdomen was not a noticeable feature, to be explained perhaps by the perforation occurring on the posterior aspect of the stomach.

I may also point out that the diagnosis resolves itself into two parts: first, the presence of acute diffuse peritonitis: and, secondly, the reference to a perforation of the stomach as the cause of it.

The case just narrated, occurring in a young healthy-looking woman, acutely, may be looked upon as fairly typical of its kind, and contrasts strongly with the details of the next case.

CASE V.

C. R., a Widow, aet. 70 years, was admitted to the Cancer Hospital on September 18th, 1897, complaining of pain in the stomach, sickness, and vomiting, which had lasted about four months.

There was nothing calling for special notice in her family or personal history, till four years ago, when she had a prolonged attack of pain in the stomach, and vomiting. The pain used to begin shortly after taking food, and was relieved by vomiting when that occurred. She was kept in bed

for six weeks under medical advice. There was no suggestion that blood was vomited. She made a perfect recovery, and kept her health till four months ago, when the same symptoms set in.

She had vomited nearly every afternoon for the past three months, and usually a dark "coffee-ground" or tarry-looking material. The motions had also been very dark. She had been lately extremely careful with her diet, without benefit. Sometimes she recognised food in the vomit, that she had partaken of at least twenty-four hours before. Whatever she took she had pain and sickness, flatulence, and great acidity. The pain was usually situated across the umbilicus.

Present Condition: She presented a very emaciated cachectic appearance. On inspection of the abdomen there was seen in the umbilical region a movable rounded tumour, which presented vermicular contraction, and was apparently bowel or stomach. In the left flank some undue distension was noticed, but on palpation it sank away, and was not definitely tangible. Just above the umbilicus there was felt on deep palpation a long and narrow induration, running upwards chiefly, and slightly from left to right. No other tumour was felt. Marked succussion sounds were readily elicited.

By percussion the lower margin of the stomach seemed to be about two inches below the normal level (i.e. below the level of the umbilicus), and the organ appeared to be of unusual size, especially in the left flank. Neither the liver nor spleen were enlarged, nor were any lymphatic glands felt.

After admission, she vomited up frequently a considerable amount of blackish-brown material, and her motions were "tarry" in character. She was extremely anaemic, and the vomited matter was found to contain blood, and also numerous sarcinae.

Examined chemically it was found to be extremely acid: and showed the presence of free hydrochloric acid with Boas's test, in all samples examined. If I had felt complete confidence in the inference to be drawn from this test, I could have excluded cancer from the possible diagnoses: but I must say, that in consideration of the patient's age, her appearance and symptoms, the dilated stomach containing sarcinae and blood, along with the faintly palpable tumour in the pyloric region, my view of the case was that she suffered from obstructive pyloric cancer.

She appeared to be daily sinking, the symptoms persisting, when, on September 18th, she

became much more collapsed, and presented an extremely bloodless appearance, was cold and clammy, with normal temperature. The vomiting altered in character, and, though never formerly violent, became now a simple regurgitation of dark matter, without the slightest voluntary effort.

She became absolutely exhausted, and so blanched that I considered serious haemorrhage was taking place into the stomach. Early next morning she died.

There had been no distension of the abdomen, no rigidity, nor apparent increase in pain, of which there had been always some, in the abdomen. The temperature did not rise, nor the pulse quicken more than a few beats. At the last occasion on which I saw her, I regret, that, not suspecting what had actually occurred, I did not percuss the dulness of the liver. A post-mortem examination was fortunately obtained, of which the following are brief notes:-

Post Mortem Report: On opening the abdomen, the stomach was seen to be very large. It reached two inches below the umbilicus, and the lesser curvature was at its lowest point at the level of the umbilicus, the perpendicular measurement between the lesser and greater curvatures being

very narrow, in the middle line.

The Pancreas lay in the lesser curvature, exposed to view.

The Omentum was directed towards the left side, the stomach being slewed round towards the left. A large dilatation existed at the upper part at the cardiac end, and another at the pylorus, the viscus being rather unusually narrowed between. The stomach occupied a more vertical position than normal, owing to its dilatation.

A fair amount of fluid was free in the peritoneal cavity, and flakes of lymph lay in it. At the lower part of the abdomen, below the stomach, lay the large intestine, somewhat expanded.

On turning up the stomach to the left side, a perforation which would admit a pencil was exposed on the outer aspect of the pylorus, and the pancreas was adherent at this point. The edges of the perforation were clean cut, and abrupt. On opening the stomach, three old-standing ulcers were found along the lesser curvature, the middle one being the larger, and very chronic, with much heaped-up, thickened edges.

The ulcer that had perforated was just at the pylorus, where there had been caused a stricture of the canal so that only the little finger could be

admitted, thus accounting for the dilatation of the organ. No blood-vessel was detected in the ulcers, nor was any other cicatrix seen.

The liver was normal, and no cancer was found in any of the abdominal organs or glands. Flaky lymph and peritonitis was seen under the diaphragm, and over some coils of intestine.

Summary of Post-Mortem: Simple chronic ulcer at pylorus, causing stricture, and great dilatation of stomach: perforation at pylorus, and fatal septic peritonitis consequently. Two other simple chronic ulcers present in stomach.

There is to be observed in this case that the perforation probably occurred about thirty-six hours before death, that it caused no severe pain, nor immediate shock, nor active symptoms: that it rapidly caused a septic peritonitis, and that this caused no rise in temperature, and not much change in the pulse, except weakness towards the approach of death. That there was quickly brought about a state of exhaustion and collapse, with cold, clammy skin, and blanched appearance, extremely suggestive of internal haemorrhage. A marked feature was the very frequent vomiting, without the slightest effort or retching of any kind - a sign, it may be noted, said to be characteristic of the approaching fatal

termination of peritonitis. Nothing could therefore be greater than the contrast between this case, and all the others I had seen, and yet I cannot say, in the light of the post-mortem examination, that there were not enough facts to have made a correct diagnosis nearly all through the case; though at the same time I cannot imagine anyone's appearance to resemble that of grave internal haemorrhage more than this patient's did, while, of course, I knew that she had been daily losing blood for weeks.

In looking into Ewald's book on "Diseases of the stomach," to see if he specially dwelt on the symptoms of perforation, I find that he says briefly that the "patient feels sudden and violent pains, in the body, under which he becomes collapsed, and in a short time the symptoms of peritonitis are developed: distension of the abdomen, violent pains on the slightest touch, vomiting, singultus, facies hippocratica, small pulse, followed by death." "But," he goes on to say, "it may happen that the rupture is not accompanied by any of these symptoms," and he then refers to a case in which "the patient having gone for three days almost without food, the stomach contained neither air nor ingesta, in consequence of which the perforation was only accompanied by symptoms of extreme shock -

unconsciousness, Cheyne-Stokes' breathing, pulsus minimus, rigor cutis, etc. - while the abdomen was neither distended nor very painful." In the details of this case of Ewald's it is noted that the patient had been reduced by haematemesis to an extremely weak state before the perforation occurred. It obviously, in many respects, resembles the case just related from the records of the Cancer Hospital.

CASE VI.

S. M., aet. 23 years, was a domestic servant in my own house. On the afternoon of April 16th 1898, she was seized with sudden severe pain in the abdomen, in the left part of the epigastric region. The pain rapidly increased in intensity, and when I first saw her about an hour afterwards, it was agonising, and her appearance was suggestive of extreme suffering, and shock. Though usually of a high colour, she was blanched and blueish, and unable to stand. When asked to indicate the site of pain, she placed her hand over the stomach region, below the arch of the left ribs, and of her own accord further complained of acute pain above the left clavicle, as if the pain were

passing up from her stomach to her neck. The pulse was between eighty and ninety, soft and regular. The temperature was subnormal. She was cold and clammy. There was no vomiting.

On examining the abdomen there was found acute sensitiveness to pressure in the epigastric region, centrally and to the left, principally about two inches below the xiphisternum, and downwards and outwards from there to about the level of the umbilicus. Over this painful area there was considerable rigidity of the left rectus and oblique muscles. Below the umbilicus there was rather a sudden prominence of the abdomen, suggesting that the muscular contraction of the abdominal wall was local in distribution, and over this prominent area, on either side, there was more resilience on palpation. Indeed, on the right side of the abdomen, below the umbilicus there was no rigidity at all.

On percussion of the abdomen the note was generally resonant.

On percussion of the liver dulness in the middle line, there was a dull note for fully an inch below the xiphisternum. In the nipple line a resonant note was obtained slightly more than three fingers' breadth above the costal margin, and con-



tinued down to that margin, merging into the abdominal resonance.

On auscultating in the epigastric region, there was heard occasionally a tinkling sound, rather peculiar in character, but not of a nature to justify any definite inference.

The respiration was mostly thoracic, but not entirely so. She complained of pain on breathing, in the epigastric region, and nothing was found in the pericardial or pleural regions to account for this.

Previous Health: About four years before, she had suffered from headaches, anaemia, and slight indigestion. When she came under my notice in the summer of 1897 she appeared to be quite strong. She had very bad teeth, and, being careless about her diet, she had once or twice become anaemic, and had indigestion, which was readily corrected by diet and medicines. Three months before the attack just narrated, her digestion had become considerably deranged, and one day she had been seized with a sudden and very severe epigastric pain, with some faintness. There was no evidence then of any perforation, nor had there been at any time conclusive evidence of gastric ulcer. However, I thought then that she might possibly be

suffering from a latent ulcer, with a localised attack of peritonitis over the stomach, and the subsequent facts prove that this had been the case. She was then kept at rest, in bed, and carefully fed on diluted milk. She rapidly improved, and the pain disappeared completely, and after a due period of rest she was allowed to get up, under strict surveillance with regard to her work, and diet. She took also Armour's Pepsin Elixir, and capsules of bichromate of potassium. A month later all her decayed teeth were removed, as the first step in regenerating her digestive system. She became after this rosy, and well nourished, her health being in every way greatly improved. In time, despite repeated caution, she began to take all kinds of prohibited food, and tea. Still she kept well, and suffered absolutely no gastric pain or discomfort of any kind. The night before the perforation occurred, some of her relations told her she had never looked better in her life. I dwell on these facts, as they show how treacherous are the conditions of such patients, and how a dangerous gastric ulcer may exist without causing any symptoms of its presence whatever. On the morning of the accident she had taken porridge and milk, and tea, and about noon a little bread and

tea. Her stomach at the time of the perforation was thus tolerably empty.

As in previous cases I founded a diagnosis of perforated gastric ulcer, with commencing peritonitis, upon the following evidence:-

1. Her past digestive history, which, more than in some cases, indicated her to be a likely subject for such an accident.
2. The mode of onset of the attack - the sudden agonising pain in the stomach region, accompanied by distinct shock.
3. The intense pain referred to the left supraclavicular region and shoulder - See Case I - II.
4. The acute tenderness on pressure over the stomach region, spreading downwards towards the umbilicus, and to the left.
5. The abdominal pain on respiration, without cause in the pleurae, and the diminution of natural abdominal respiratory movement.
6. The presence of distinct, though in this case partial, rigidity in the abdominal muscles.
7. The comparatively slight, but, at the same time, distinct diminution in the liver dulness. At the subsequent operation, the liver was found to project further down than usual (possibly from tight-lacing) so that the percussion dulness should have been found even beyond the costal margin, and to midway between the xiphisternum and umbilicus. Had this fact been in any way available before opening the abdomen, it would have greatly emphasised the importance of the alterations found in the liver dulness.

Later Condition: To relieve the intolerable suffering, I gave her a hypodermic injection of morphia, one third of a grain, which had a remarkable effect, so that within half an hour the subjective pain had entirely vanished (there was still some pain present on palpation), the appearance of shock passed off, and she actually said she felt she could get up and do her work.

The diagnosis had, however, been made with confidence, so she was removed with all care in an ambulance to the Western Infirmary, Dr. Beatson having kindly consented to admit her to wards then under his care. He, later on, performed the operation. The liver presented somewhat low down. There were then seen some thick yellow flakes of purulent lymph, and on these being traced up, and the portion of stomach near which they lay drawn out, it was seen that the peritoneum over the viscus was thickened, rough, and reddish, with several old omental adhesions: and, partially concealed by one of these was a sharp round perforation, with a diameter about that of an ordinary quill pen. It was situated under the liver, and on the upper and anterior surface of the stomach, near the pylorus. There was no evidence of extravasation of food or fluid.

With regard to the operation I need only say that it was carried out from first to last with perfect success, and that the patient made an excellent recovery. I saw her a year afterwards in excellent health, and heard that she intended again to enter domestic service.

Remarks: The old adhesions and roughened peritoneum pointed to a former inflammatory attack, and threatened perforation, and this probably occurred three months before, when she had an attack of severe pain in the epigastric region, as noted. A very slight leakage had taken place, and this had set up local peritonitis only. There was none of the widespread acute peritoneal irritation which accompanies free extravasation (See Case VII).

The abdominal muscular rigidity was localised, just as the peritonitis was. The pain, however, was just as intense, even more so than in some cases I have seen where the leakage was profuse. The morphia had a remarkable effect, and entirely masked for a time the serious condition of the patient, illustrating the rule, that before opiates are used in abdominal cases the diagnosis should be clearly established.

It seems just possible, that, under the treatment formerly in vogue, of absolute rest,

rectal feeding, and full doses of opium, this patient might have recovered. Doubt might then have been cast on the diagnosis. I believe I have met with such a case, though, of course, absolute proof was wanting. Fagge quotes an interesting example, recorded by Hughes in "Guy's Hospital Reports," where the proof was obtained four months later by the death of the patient from recurrent perforation, which was verified post-mortem. (Hilton Fagge, Vol. II, 1886. p. 244.)

P.S. Before leaving this case I may record a fact recently come to my knowledge. S. M. returned to domestic service in Helensburgh. She kept well for a short time apparently, there. In November 1899, Dr. Beatson was urgently called to Helensburgh to see a girl who was believed to be suffering from perforated gastric ulcer. He tells me he went down, and found his old patient S. M., undoubtedly suffering in the same way again. Dr. Beatson did the operation, found the perforation, carried through the necessary procedures, and after a severe illness the girl recovered, and in time went back to the Highlands. She continues well. I should be inclined to think that this is a unique

CASE VII.

I was enabled to see this case through the kindness of Dr. Mechan, who, knowing my interest in the subject allowed me to see the patient with him.

A. M., aet. 33 years, a tradesman, was seized with very severe abdominal pain in the early morning of May 29th, 1898. Briefly, his history was as follows:-

For many years previously he had suffered from "dyspepsia," characterised by pain in the stomach, and vomiting. He had often been partially laid up with this complaint. He had never, to his knowledge, vomited blood. For a week past he had not been feeling well, and had suffered a good deal of gastric pain in connection with food. On May 28th he had been pretty bad with pain and sickness. In the evening, about 10 p.m. he partook of mutton pie, and drank some milk, went to bed, and slept well. At 2 a.m. on the 29th he was awakened by a violent pain in the "pit of the stomach," which came on suddenly, with sickness. He felt at once very ill and faint. When seen he complained as above, and also of sharp pains in the left shoulder, above the clavicle: "rheumatic" pains, he thought

they were. He appeared to be in great distress, and was pale and ill-looking. The pulse was soft and quiet, not weak or quick. The temperature was normal.

Inspection, and palpation, of the abdomen, showed that it was remarkably rigid all over. Every muscle, and section of muscle, stood out in relief. The sensation to touch was quite board-like.

There was considerable tenderness on pressure over the epigastric and umbilical regions, and just under the arch of the left ribs. He lay with his knees drawn up, as this gave him relief. He felt much abdominal pain on breathing. The respiration was almost entirely thoracic. Nothing was heard on auscultation over the abdomen.

On percussing for the absolute liver dulness, the shape of his chest being long and narrow, the upper limit seemed to be unusually low down, but it did really lie at the level of the sixth rib in the nipple line. From thence absolute dulness extended, not only down to the costal margin, but beyond this to the right groin. This abdominal dulness was then found to pass laterally into the right flank, occupying it entirely, and inwards to the left it reached to about the middle of the

right rectus muscle. Elsewhere the percussion note was resonant; indeed, very highly so in the epigastric region, and below the left costal arch. The peculiar area of dulness was explained on turning the patient on to his left side, when the abdominal dulness on the right side gave place to comparative resonance, with the reverse condition on the left side. It was then possible to percuss the liver dulness in the nipple line, and this was found to extend from its upper limit to within between one and two inches of the costal margin. The total absolute liver dulness measured about two inches. From these signs it was concluded that there was an effusion of fluid under the right abdominal wall, below the liver and pylorus, which moved freely in the peritoneal cavity: and that there was also gas in the peritoneal cavity, as the liver dulness was certainly diminished. The abdominal rigidity, pain, and tenderness, collapsed look, flexure of legs, respiratory abdominal pain, and thoracic breathing, pointed to acute peritonitis: and the diminished hepatic dulness, together with the past history of the patient, and the mode of onset of his illness, suggested that a ruptured gastric ulcer was the condition present.

Dr. Mechan had the patient removed to the

Western Infirmary as safely and promptly as possible, and, on his part, gave the patient every chance, as the necessary operation was undertaken between four and five hours from the occurrence of the perforation. Unfortunately the patient sank, and died twenty-four hours later.

Dr. Mechan told me the perforation was found, after a little trouble, posteriorly, near the pylorus: and that the gastric coats around it were in a friable and unhealthy state. The orifice of the rupture had a diameter about the same as an ordinary quill pen.

This history shows how rapidly in some cases serous, or sero-purulent effusion gathers in the peritoneal cavity. Mr. MacGillivray remarks on this in his paper in the "Scottish Medical and Surgical Journal," July 1899. Dreschfeld, in his article on Ulcer of the Stomach, in Allbutt's "System of Medicine," says "If much fluid passes out from the stomach, the percussion note over the lateral and lower parts of the abdomen may become dull (a very rare occurrence): this symptom may also be noted subsequently when peritonitis is well established."

In the case above, the signs of fluid were present two hours after the rupture: and less

than five hours after the rupture, the fluid, when seen at the operation, was not apparently gastric fluid: but no doubt in this case it was a mixture of the stomach contents, and a rapid serous peritoneal effusion.

I may also point out that the diminution in the liver dulness coincided with a flat, retracted abdomen - very different from its absence or diminution later on, when tympanitic distension of the bowels has set in.

Dreschfeld also says: (loc cit.) "If the patient do not die from collapse during the first six to twelve hours, symptoms of peritonitis set in." I have seen cases within one, two and three hours after perforation, and the symptoms, being such as recorded in the fore-going cases, suggest that inflammation of the peritoneum immediately follows on the effusion of gastric contents, it being impossible to define where the primary acute peritoneal irritation ends, and inflammation begins.

Cases	Age	Duration of Perforation	Pulse	Temp.	Shock	Vomiting	Liver Dulness	State of Abdomen	Respiration	Referred Pains	Tinkling Sounds	Site of Perforation	Result	
1	A. B.	26	1½ hours	96	98	Severe	None	Not Altered	Very Rigid	Costal	Widely Distributed	None	Anterior Pylorus	Recovered, after operation
2	C. D.	25	½ "	96	98.4	Slight	None	Diminished	Very Rigid	-	Clavicular	Present - Remarkably	Anterior	Recovered, after operation
3	E. F.	23	Not ascertained	-	-	-	-	-	-	-	-	Splashing	Cardiac End	Died, unsuccessful operation
4	G. K.	22	¾ hour	90	98	Severe	Once	Diminished	Some Rigidity	Costal	None	Present, Indefinite	Posterior Pylorus	Died, after operation
5	C. R.	70	Doubtful	A little rapid	Nor.	Not apparent	Incessant	Not tested	Not any Rigidity	-	-	-	Anterior Pylorus	Died, No operation
6	S. M.	23	1 hour	80-90	Nor.	Distinct	None	Diminished	Local Rigidity	Mostly Costal	Left Clavicular	Present, Indefinite	Anterior near Pylorus	Recovered, after operation
7	A. M.	33	2 hours	Normal	Nor.	Distinct	Once	Diminished	Very Rigid	Costal	Left Clavicular	None heard	Posterior near Pylorus	Died, after operation

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2	C. D.	25	½ "	96	98.4	Slight	None	Diminished	Very Rigid	-	Clavicular	Present - Remarkably	Anterior	Recovered, after operation
3	E. F.	23	Not ascertained	-	-	-	-	-	-	-	-	Splashing	Cardiac End	Died, unsuccessful operation
4	C. K.	22	¾ hour	90	98	Severe	Once	Diminished	Some Rigidity	Costal	None	Present, Indefinite	Posterior Pylorus	Died, after operation
5	C. R.	70	Doubtful	A little rapid	Nor.	Not apparent	Incessant	Not tested	Not any Rigidity	-	-	-	Anterior Pylorus	Died, No operation
6	S. M.	23	1 hour	80-90	Nor.	Distinct	None	Diminished	Local Rigidity	Mostly Costal	Left Clavicular	Present, Indefinite	Anterior near Pylorus	Recovered, after operation
7	A. M.	33	2 hours	Normal	Nor.	Distinct	Once	Diminished	Very Rigid	Costal	Left Clavicular	None heard	Posterior near Pylorus	Died, after operation

The table just given sets forth a comparison of some of the features in these cases.

No. 3, E. F., was a case of subphrenic abscess, and has to be distinguished from the others, in all of which the perforation directly communicated with the general peritoneal cavity.

Leaving out No. 3, we find that No. 5, C. R., is very different from the others, chiefly, however, because the condition was not recognised, and observations were not made. The vomiting was caused by the presence of peritonitis of acute septic nature.

The other five cases, however, are typical of the ordinary perforation into the peritoneal cavity. It will be noticed that they came under observation at a very early period. All were operated on very speedily: three recovered, and two died. The perforation was anterior in the three that recovered: posterior in the two that died. The symptoms are thus those of almost the earliest possible period, when diagnosis is all-important. The numbers are, of course, too few for any statistical purposes, but the cases may serve as a text for some general remarks on the chief symptoms.

GENERAL REMARKS ON SYMPTOMS, DIAGNOSIS ETC.

A. THE SEX AND AGE OF PATIENTS

Whether we deal with perforation into the general peritoneal cavity, or with those so localised as to form a sub-phrenic, or otherwise situated, collection of pus, it is well known, that, broadly speaking, the sex of such patients is female: and the age that of adolescence and early maturity. Exceptions, of course, are numerous. My own limited experience embraces one female aged 70 years: and a male. At the other extreme Roderick Maclaren mentions the case of a girl, aged 14 years. (British Medical Journal 1899, Vol. II, p. 863.)

The proclivity of a certain sex and age is, of course, due to the fact that simple gastric ulcer occurs most commonly in that sex, and at that age.

Speaking of perforation, Leith says it is "specially liable to occur in young chlorotic women." (Loc. Cit.)

Spencer puts it that "young women between (Medical Annual, 1900, p. 506) sixteen and thirty,

especially when anaemic, are the commonest subjects, but men and older women suffer, although less often."

Given any patient in whom simple gastric ulcer has been diagnosed, then naturally the occurrence of perforation ceases to have any relation to age or sex. It will then depend chiefly upon two things:-

1. On the acute, or chronic, course of the ulcer. Leith says it is most common in the acute variety. And this is so. And yet many ulcers that have been found perforated show evidence of long standing, when no adhesions have formed.
2. The position of the ulcer, and the possibility of adhesions forming.

We cannot, therefore, from the age or sex of the patient, expect any special assistance in diagnosis. Indeed the exceptions to the general rule must specially be borne in mind, in case the lessened likelihood of perforation in a man, or aged person, incline one to error.

B. THE TIME ELAPSED SINCE PROBABLE PERFORATION

In all cases this factor is important to determine: with a view to diagnosis, prognosis, and treatment.

The value of some of the signs depends on the

time between their development and the perforation. Especially is this the case in "absence of the liver dulness."

The symptoms, indeed, have all a more or less important relation to the lapse of time, and might well be divided into:-

1. Those occurring immediately, which are sufficient to diagnose perforation of the stomach.
2. Those occurring later, which are evidence of a developed peritonitis.

In some obscure cases of intra-abdominal suppuration, and thoracic complications, the possibility of a perforation of the stomach some time previously may be a clue of utmost value. Hence the recent history of the patient should be searched for indications of such a thing.

As to Prognosis, if operative interference is to be undertaken, the element of time influences the result largely, as is seen on examining statistics, of which as an example of others it will suffice to quote those of 83 cases collected by Lundle.

(Edinburgh Hospital Reports, Vol. IV, p. 489.)

Operation under 12 hours,	22 Cases,	14 Recoveries	<u>64%</u>
do 12-24 "	23 Cases,	6 Recoveries	<u>26%</u>
Operation <u>over</u> 24 "	38 Cases,	5 Recoveries	<u>13%</u>

"These percentages are probably all too high, in consequence of unrecorded failures: their rapid

decline is none the less significant, and gives warning most eloquently of the dangers of delay."

We may note also that Keen and Tinker mention 26 cases operated on within 12 hours, with 80 per cent. of recoveries; (Philad. Medical Journal, 1898, Vol. I, 1104), while in 16 cases operated on from within 12 to 24 hours, there was but 50 per cent. of recoveries.

The Treatment, in this connection, can only be said to be influenced by the condition of the patient which has supervened since the time of the perforation. In some cases a few hours renders the hope of any treatment negative. In others success has been attained after a lapse of many hours. The condition of the patient is the real guide. The longest interval, that I have been able to find, between perforation and a successful operation is in the case detailed by Mr. Nicoll (Glasgow Medical Journal, April 1900, p. 255) where six days had elapsed. Notwithstanding widespread peritonitis, and subsequent general pyaemia, this patient recovered.

On the other hand, if the history and symptoms pointed to a perforated ulcer, and, after some time had elapsed, the patient were to show improvement, under medical treatment (a somewhat rare, but often

enough recorded circumstance) then it would be justifiable to postpone surgical interference. I believe I have seen a case of this nature, where the diagnosis certainly appeared to be perforated gastric ulcer. After consultation with two surgeons the imminent operation was postponed, to my regret at the time. As time passed, however, the patient, a male, aged 38 years, being kept under close observation, the justification of operation diminished, and a good recovery was eventually made.

Marshall, in Glasgow Medical Journal, February 1900 p. 94, relates an interesting case, where, despite surely many temptations to have an operation, the condition of the patient had apparently justified him in continuing medical treatment, which, after a long and complicated illness, was ultimately successful. In his paper he says "among numerous records of cases of perforation of the stomach, there appear to be quite a number in which recovery took place," and that in nearly all of these no food had been taken for some time before the perforation took place. He quotes Fraser, Lancet, 1861, as reporting two such cases, Redwood in the Lancet of 1871, one case, and also Ross, one case, in Lancet 1871.

C. SHOCK, INCLUDING THE CONDITION OF THE PULSE, AND TEMPERATURE -----

This symptom is subject to great variations. As before mentioned it may vary from nil, to instant death. Many authors, I think, magnify its intensity, and its importance, in the general run of cases. They speak of operation being necessarily postponed till "shock has passed off." This seems to be somewhat risky teaching. The anaesthetic, and the effects of the operation, are able to remove the cause of the shock. If it is not speedily removed, a worse state is apt speedily to supervene. Considering, too, that in some cases death occurs twenty-four hours after perforation, if no operation be done, and that according to statistics the mortality increases enormously by delay in those cases in which an operation is performed, it is obvious that postponement of operation on account of shock must be very cautiously agreed upon. The differences of opinion amongst surgeons, on this point, are observed in a perusal of the discussion (on the question of perforated gastric ulcer) at the British Medical Association Meeting in 1894.

In the same year, Affleck, in a paper in the Edinburgh Hospital Reports, says (p. 196) "The

"shock which follows the perforation, and which, as
 "far as I have observed, seems decidedly more severe
 "in the case of the stomach than in that of the in-
 "testines, at once places the patient beyond reach of
 "reasonable hope from any operative interference, at
 "least in the large majority of cases. For it must
 "be admitted that the immediate effects of perforation
 "differ in degree in different cases, some apparently
 "suffering much less than others. In most, however,
 "the profound nervous impression is manifested not
 "merely by the pulse, but by the countenance, and
 "the 'abdominal look' carries with it, to my mind,
 "the prelude to a fatal issue, In
 "a considerable experience of cases of perforative
 "peritonitis, I cannot recall any patient in whom this
 "facial expression was pronounced, surviving the oper-
 "ation of laparotomy."

Comparisons on the basis of this last clause
 must be most difficult, from the variations in the
 observers' ideas as to how much exactly the "facial
 expression" must show. While, in my own cases, Nos.
 IV and VII showed the "facial expression" very de-
 cidedly, and died after operation, I consider that
 in Nos. I and VI the severity of the shock sustained
 was also markedly expressed in the face, and both re-
 covered. It is only of course of the early facial

expression, before septic peritonitis has become established, that it is worth while speaking of in this connection. Probably in 1900 Affleck's opinion on the question of shock and operation is much more hopeful than it was in 1894.

In all my own cases the shock seemed largely to depend on the severity of the pain felt: see Case VI specially in this connection. In that case the appearance of shock vanished when the pain was relieved by morphia.

In none of the cases was the shock such as to cause any idea of delay in operation. Neither in any did the condition of the pulse, or temperature, suggest it.

Certainly considerable depression of vitality was present, as evidenced by the appearance, clammy skin, etc., but the pulse never was alarmingly weak, nor in any case did I think it necessary to give stimulants either by the rectum, or subcutaneously.

Cases of sudden death from perforation of gastric ulcer have, of course, been recorded, (Littlejohn, Maurice, and others), while, on the other hand, Pearce Gould mentions a case in which shock was absent altogether.

We can therefore say, that, as regards shock, each case must be treated on its own merits, always

bearing in mind that much delay is in many cases a fatal error: and that as regards diagnosis it is a symptom of very slight value: and that there is more reason to fear deception by the absence, or minor degree, of shock, than there is from its intensity, for in the latter event a serious internal disaster is more certainly suspected. So far as the pulse is concerned, it was not, in any case seen by me, much altered from the normal. As a diagnostic sign, Martin, in his "Diseases of the Stomach" says the "pulse is extremely rapid." If a student were to trust to this statement he would likely be seriously misled. From my own experience, I can safely say that the pulse cannot be any guide to rely on: and again deception will more likely occur from absence of much change in it, than from any marked alteration, if such be expected. This, of course, applies to the very earliest stage, before acute peritonitis has become developed. Martin means that early stage, when he makes the statement quoted.

In addition, the pulse of abdominal shock - and that is the condition present - is just as likely to be slow, as rapid. I shall never forget the pulse of 54 which was present in the early stages of one of the most complicated and rapidly fatal cases of internal hernia and volvulus I ever saw. It was

the pulse of abdominal shock - from severe sudden nipping and strangulation of a large area of small intestine.

Spencer thus alludes to this question (loc cit. p. 507):-

"The pulse is usually quickened, and steadily rises. Perhaps a steadily rising pulse is, in an obscure case, the most certain indication for surgical interference: exceptionally, when the shock is very severe, the pulse rate is sub-normal. Subsequently, the signs of general peritonitis become more and more marked."

The Temperature, in all my cases, was normal or sub-normal, as might be expected, in the first early stage, with which alone I am dealing. There is nothing in relation to it calling for further comment.

Not a little of confusion on the questions of "shock," "pulse," "temperature," "facial expression," and other symptoms, arises from an omission on the part of writers to sharply distinguish the symptoms of the first or second hour after the perforation, from those following some five to ten, or more, hours later.

D. VOMITING

This has been included by some authors as a symptom of perforation. For instance Hemmeter, in his "Diseases of the Stomach," 1898, (p. 480) says - "The diagnostic signs of perforative peritonitis are:-

- (a) Great rigidity of the abdominal muscles: flat abdomen.
- (b) Disappearance or diminishing of the liver dulness: this sign may be absent, however, if only liquid gastric contents and no air escape into the peritoneum.
- (c) Vomiting."

It seems strange that when only mentioning three diagnostic signs, two of the utmost and first importance, he should have included, as his third, a symptom which has little or no diagnostic importance at all. What, it may be asked, is a student to gather from such a description, in a text-book of 1898. He might find a patient with retracted rigid abdomen, and absence of liver dulness, and yet, if vomiting were not and had not been present, one third of his diagnosis would be incomplete. In looking into many books on the subject, I have closed many of them finally just because they were so unsatisfactory, as in the above instance, giving only vague hints as to the signs and symptoms of

the occurrence of perforation, or dealing with it in a parenthetical manner, with no clear and vivid treatment of the subject as one of vital interest and importance. Martin (*loc cit.*) mentions vomiting amongst the chief symptoms - "faintness and vomiting" he says. But after all it is only an occasional symptom. In my own cases No. V had incessant vomiting, but it was the vomiting of septic peritonitis. (*Loc cit.*) Dreschfeld says, it is "generally absent, if it occurs at first it soon ceases," and this view is, I believe, the correct one. In cases No. IV and No. VII the patients vomited once, and in three other cases absolutely not at all.

It is necessary to mention its occurrence occasionally, but not to dwell on it, or to elevate it to the rank of an important symptom. To do so is, I think, dangerously misleading. In support of this I may further quote Barling (*British Medical Journal* June 15th 1895) who says "one or two vomits may take place, though this is hardly the rule."

Marshall (*British Medical Journal* November 13th 1893) says that vomiting "though a frequent symptom," is, "by no means always present."

Spencer has it (*loc cit.*) "Vomiting is often absent: it may occur once or so at the time of

perforation, and be repeated if anything is swallowed, but usually it does not become frequent until peritonitis has set in."

E. THE LIVER DULNESS

As again exemplifying the inequality in textbooks of the treatment of the subject, it may be noted that Martin (loc cit.) in discussing perforation into the peritoneal cavity does not mention the liver dulness at all. Hemmeter, on the other hand, in a very scanty reference, gives it due notice.

Osler (1896) makes no mention of it at all. It is otherwise in Allbutt's System of Medicine, where the whole subject is succinctly and continuously dealt with. On the question of liver dulness Dreschfeld says (Vol. III, p. 536) "percussion gives a tympanitic note all over the abdomen, with absence or considerable diminution of the liver dulness, from the accumulation of gas between liver and diaphragm: this has been described as a pathognomonic sign of perforation, but it may be absent if adhesions exist between the stomach and liver: on the other hand, we may have this symptom

without perforation in simple tympanites, if coils of intestine distended with gas find their way between the diaphragm and the liver, and it may occur in simple non-perforative peritonitis."

In my notes on Case I, I gave a sufficient account of the usefulness of the lateration of the liver dulness, as a sign: and have also referred to it in the remarks on the other cases. I would only say now, that to estimate its true value, the state of the abdomen generally, must be taken into consideration, and clearness on this subject is usually absent from the reports of cases. The confusion is evident even in Dreschfeld's remarks - in the last clauses.

If the abdomen is flat, or still more if it is retracted, diminution, or absence, of liver dulness carries much weight. If there is distension of the bowels at all the sign loses at once in value, and becomes fallacious. Further, it seems from examination of various livers in healthy people that percussion gives very variable results, especially in the middle line. So much depends on the state of the bowels, and stomach, the shape of the chest, and the volumnosity of the lungs. As a rule, though not always, the absolute liver dulness extends, in healthy people, down to the costal arch

in the nipple line, and in the middle line to the third of the distance between the xiphisternum and umbilicus, though this measurement is much more liable to variation than the former one: especially in stout people is it difficult to define, and in people with broad costal angles: in them, under even suspicious other circumstances, I would hesitate to attach importance to absence of liver dullness in the middle line. Again in people with long narrow chests, especially women, the costal margin, in the nipple line, may reach as low as to be within one inch to half an inch of the level of the umbilicus: and in such people, in whom there was no question of perforation, nor any reason to suspect cirrhotic contraction of the liver, (and in whom also the total liver dullness was of about a normal extent), I have sometimes found a resonant note for from one to nearly three inches above the costal margin. Herein, therefore, there is the possibility of making erroneous deductions, and the question is a difficult one. It suggests the importance, in a general practice at least, of knowing the percussion limits of the liver, and its relation to the costal margin, in all one's patients who might be suspected to develop, at any time, symptoms of gastric perforation: just as we

accustom ourselves to the rhythm and character of murmurs, the size of the heart, and the location of the apex beats, in our cardiac cases. Assistance, of course, is obtained from the measurement of the total liver dulness, in addition to the relation of the liver dulness to the costal margin, and a careful consideration of the whole facts may be expected to lead to a correct conclusion. In this connection Spencer says (loc. cit. p. 507) "there may be diminution or loss of liver dulness. This is a very uncertain sign: it is due to collection of gas above the transverse colon. Yet old adhesions may prevent the gas from influencing the liver dulness, which therefore persists: also, the liver dulness is a variable quantity which is altered by distension of the colon, whether by constipation, or by a band."

With regard to the anatomical position of the liver, Owen in his "Manual of Anatomy" p. 332 refers to the lower border "crossing the middle line about three inches below the base of the xiphoid cartilage."

Also (p. 334) "ordinarily, the liver dulness extends to the eighth rib at the side of the chest." Cunningham in his "Dissector's Guide" states that "In the male the anterior sharp border projects

very slightly, if at all, below the ribs, but in females and children it almost always extends a short distance beyond them."

Hunter in "Anatomy of the Liver" in Allbutt's System of Medicine, Vol. IV, p. 4, says "the lower limit of the hepatic dulness in the middle line is found about an inch below the xiphoid cartilage: the hepatic dulness at this point occupying the upper third of a line between the xiphoid cartilage and the navel. . . . On the right side the lower limit of dulness is found, during quiet breathing, in the mammary line about the edge of the costal arch, half an inch above or below."

In my own experience the liver dulness was carefully examined in five of the cases. In one it was not altered, so far as I could make out. In the other four it was diminished noticeably. In none at all was it absent altogether.

In Case I, with a retracted abdomen from pyloric perforation, it is difficult to see why some diminution did not occur, but presumably the explanation is that there was but little gas in the stomach to escape, and that absorption of it, or dispersion of it in other situations, had taken place: there were no adhesions of the liver to the

stomach, or other part.

F. CONDITION OF THE ABDOMINAL WALLS

Extreme rigidity and board-like feeling was well marked in three of the cases observed by me: some rigidity, probably much more than apparent, owing to stoutness, present in a fourth: local rigidity in a fifth, very marked: and, strange to say, none at all in a sixth. That case, however, was peculiar in many ways, and perhaps the feeble general state, and advanced years of the patient, must be held to account for it. In the formation of a sub-phrenic abscess the presence of general abdominal rigidity is not so marked, but at the earliest stage of perforation the parietes over the site of the commencing inflammatory area would naturally be rigid and tender, if within reach of palpation. In the early hours after perforation it must be borne in mind that the abdomen is frequently retracted. This was certainly the condition in four out of the six cases recorded here, where the perforation occurred freely into the peritoneal cavity.

Dreschfeld speaks of the (loc. cit.) "abdomen as a rule distended: but in a few cases, as pointed

out by Wagner and myself, it may be retracted by the spasm of the abdominal walls." Hemmeter says "great rigidity of the abdominal muscles, flat abdomen."

(loc. cit p. 480) Spencer remarks (loc. cit. p. 506) "At first the epigastrium is soft, after a few hours it becomes rigid and retracted, then distended as peritonitis becomes established. The early lack of rigidity may prove deceptive." I have not in my own experience met with a case which justifies this description. Indeed the very early presence of great rigidity was the striking feature in most cases.

Martin makes an unfortunately vague and really misleading statement on the point when he says (loc. cit. p. 444) "the presence of fluid and gas in the lower part of the peritoneal cavity may not be discoverable owing to the rigidity of the abdominal muscles, but it may be seen that the abdomen generally is moderately distended, the degree of distension depending on the amount of gas and liquid in the stomach at the time of perforation." I cannot see that percussion of fluid or gas is interfered with by the rigidity of the abdominal muscles, and other means than percussion are not necessary or desirable. Further, it is incorrect to say that the abdomen is "generally moderately distended," for

I am certain that in the earliest stages it is more often retracted: and, in any case, the distension, if present, can never almost be due to the amount of liquid and gas which has escaped from the stomach. There is no account taken here of the extreme reflex contraction of the parietal muscles which much gas and liquid, escaped into the peritoneal cavity, at first gives rise to. The discrepancies thus found between authors on this, and other points, and the fact that still more writers ignore the details of diagnosis entirely, and that those who record cases, but seldom enter fully into the diagnostic features, causes me to dwell on these topics. It might be well to formulate definitely the facts regarding the condition of the abdominal walls - such as I believe them to be. I believe, then, that in the majority of cases of sudden perforation of a gastric ulcer into the peritoneal cavity, if the patient be seen within one to three hours of its occurrence, the abdomen will be found remarkably rigid, and retracted to a considerable degree.

Further, that if the escape of fluid and gas be scanty and localised, and in a region below the costal margin, that there may be only local rigidity of the muscles. That every hour that elapses from

the time of the perforation must bring a gradually increasing tumidity and distension of the abdomen: which will be the manifest condition, say ten to twelve hours, or later, after the perforation; but that this distension depends upon the rapidity with which acute peritonitis and intestinal paralysis occur, and is secondary entirely to the perforation. That the amount of gas and fluid escaping from the stomach cannot be conceived to distend the abdomen in the face of the strong reflex contraction set up in the parietes: until at least the second stage of peritonitis has set in, with secretion of peritoneal fluid, and relaxation of the muscular rigidity. In support of this view Marsham says (loc. cit.) "Abdominal rigidity in the early stage, and distension later on, were frequently noted," and Barling, "The abdominal wall will be found to be retracted, and the muscles rigid, as though by packing the viscera together they were endeavouring to limit extravasation."

G. THE RESPIRATION

Barling says the "respiration is usually thoracic, quick and shallow." This is in the earliest

stage, shortly after perforation, with an abdomen more or less rigid and retracted. The later thoracic respiration associated with developed peritonitis is not referred to here. The point is that thoracic respiration may be present at once - as one of the quite earliest signs.

In Cases Nos. III and V I could not expect to find it, and in Case No. II, I have no note of it. But in the four other cases it was present in each, and made rather a striking picture, in association with the general condition.

There was also in three out of these four cases, pain on respiration, felt in the abdomen. The breathing was inclined to be shallow in these cases, "cautious" one might say. It was not in any case that I saw sufficiently quick to call for special notice.

With regard to the respiration, then, it suffices to say that it is usually thoracic in type, often remarkably so, shallow, and sometimes accompanied by abdominal pain.

H. THE PAIN

Generally the pain is sudden in onset, and very severe. The worst pain may be heralded by

attacks of slighter pain. It is felt usually in the "pit of the stomach," or between the xiphisternum and umbilicus, and to the left of this: or it may be in the left hypochondrium: or in rare instances in the right iliac fossa, or some part of the abdomen removed from the situation of the stomach: but by far most commonly in the situations first mentioned.

The pain may remain localised at its point of origin, but usually it spreads steadily so as to involve a wider abdominal area. The pain is described as "burning," "agonising," "boring," "dreadful," and seems to be of a very sharp, excruciating kind.

There may be also pains of "referred" nature in the thorax, shoulders, and neck, but these are unaccompanied by tenderness on pressure, while the abdominal painful areas are tender, sometimes exceedingly so, to touch. Palpation may elicit one specially tender spot in the epigastric region, with lessened tenderness radiating outwards from it.

This symptom of pain, its nature and situation, is one of the most striking presented. Its effects on the patient are frequently profound, and in more than one of my own cases I felt convinced that some disaster must have occurred internally, before the

clear, clinical evidence of it was obtained.

The pronounced symptom of abdominal pain is always referred to in records of cases, though usually not in detail. But it is comparatively rare to come across any allusion to pain in the shoulders or neck, or elsewhere than the abdomen. In five out of seven cases, I had a chance of determining this point, and "referred" pains were present in four. (See Case I, specially, and others.) In Case I the pains were very widely distributed, and as much complained of as the abdominal pains, especially the pain in the back, and behind the sternum. In no other case have these pains been so severe: in the other three they were chiefly in the clavicular and acromial regions. Apart from their interest, these pains, as I have pointed out in my remarks upon the cases, offer some assistance in diagnosis. They must often be present, I am certain, but one seldom comes across reference to them, and I have read the records of case after case, and found no notice of either presence or absence.

Dr. Affleck (loc. cit) records one case in which "pain was greatest in the left hypochondrium, and darting upward to the left shoulder and neck." In another case of his there was a sudden "violent pain in the epigastrium, extending both to the right

and left, and shooting through to the back."

In Lundie's case (Edinburgh Hospital Reports, Vol. II) the pain was "agonising in the left side at the waist, went straight across the waist to the right side (here it was even more severe than where it began) and quickly spread downwards all over the front of the abdomen. The pain was so intense that she thought at first she was going to expire at once . . . Very soon a pain came on in the right shoulder."

In a case reported by Leith (Edinburgh Hospital Reports, Vol. IV) "There was severe pain in the left side radiating all over the side of the chest and abdomen."

In Case I, of my own, and in Lundie's case, and in a very striking and typical example reported by Morse (British Medical Journal, February 12th 1897) the feeling of impending death was present. The patient also hardly dared to move, a state exactly similar to Case I of my own, where she would not move a finger, and only whispered, so anxious was she to remain perfectly still.

In Mr. Morse's case "the pain commenced in the left hypochondriac region, and rapidly spread all over the abdomen." Osler (loc cit.) mentions a case in which there was "pain in the left shoulder,

and excessive pains in the back on movement."

Numbers of cases might be quoted, but too many of them only cause a desire for more information with regard to the extent and course of the pain. An important point is referred to by Dreschfeld when he says that the pain "may be seated rather over the right iliac fossa, and simulate the perforation of appendicitis, or pyosalpinx: this I have seen in not a few cases."

Various writers explain this by the gravitation of stomach contents into that region. See Transactions of the Medico-Chirurgical Society, Glasgow, Vol. I, p. 49. In Dr. Marshall's paper, Glasgow Medical Journal, February, 1900, there are references to two cases in which pain in the shoulder had been noted as a symptom, so far back as 1861 and 1871.

The "referred" pains are of interest in connection with the presence of cutaneous areas corresponding to internal viscera. More facts than I have given regarding them in connection with Case I, are unnecessary here, but I think that special investigation of them in each case would repay trouble, besides assisting in the diagnosis.

I. TINKLING OR BELL-LIKE SOUNDS IN THE
ABDOMEN

In cases of sub-phrenic abscess the signs in the left hypochondrium, and under the ribs up to the level of the normal stomach, resemble often very closely those of pyo-pneumo-thorax: and Case III exemplified this in a very striking manner.

However, leaving sub-phrenic abscess out of count, and considering only cases of perforation into the peritoneal cavity, I heard such sounds in three out of four cases in which they were listened for. In Case II the sounds were so peculiar, that I felt some assurance in the diagnosis from the presence of similar sounds in Case IV. In Case VI they were distant, and faint, and as I have said, not definite enough for diagnostic purposes. The sign is one, however, to be looked for. If once heard, the ear can I think easily distinguish the sounds from the usual gastric and intestinal ones. To describe them in words is difficult. It is best to call them tinkling or bubbling noises.

I have found no reference to these anywhere, in cases of perforation into the peritoneal cavity.

J. SITE OF PERFORATION

In the case of sub-phrenic abscess it was at the cardiac end. In the six cases of perforation into the peritoneal cavity the perforated ulcer was on the anterior surface, near the pylorus in four, and posteriorly, near the pylorus, in two.

In Case V, an anterior ulcer, where perforation was unsuspected, there was, of course, no operation.

Of the other five cases of perforation into the abdominal cavity, all were operated on, and the three anterior perforations recovered, and the two posterior ones died.

While the figures are useless for statistical purposes, they are not due to coincidence, I suspect, but point to the fact that posterior and inferior ulcers near the pylorus, are likely to be much more serious, if perforated, than anterior ulcers; for two reasons, chiefly, that they favour free extravasation of the stomach contents, and that they offer more difficulty to the surgeon, and prolong the operation, and thus possibly tend to diminish the time spent afterwards in cleansing the peritoneal cavity - a process of extreme importance in the operation.

While the perforation of a posterior ulcer must

be considered, I think, to have considerable influence on the prognosis, I do not think that any of the signs or symptoms of perforation can assist us in telling beforehand whether the ulcer is anterior or posterior. We cannot depend, in endeavouring to determine this point, either on the situation of subjective pain, or objective tenderness. Each is apt to be removed from the actual point of perforation, perhaps very far removed.

K. PRESENCE OF EXTRAVASATION ON TO THE PERITONEUM -----

There may be very much extravasation present: there may be little: or there may be none: and on this point depends partly the symptomatology, the prognosis, and the treatment.

The variations in this factor of extravasation obviously depends on three things:-

1. The situation of the ulcer
2. The size of the rupture.
3. The state of the stomach with regard to quantity and quality of contents at the time of rupture.

It is a mechanical question. Its results

are vital. A small perforation situated near the lesser curvature of the stomach, anteriorly; with an empty stomach, may cause not more than a localised peritonitis, with modified symptoms, or only suspicion of perforation.

Conversely to this, the rupture of an ulcer situated near the greater curvature, posteriorly, with a full stomach, and free rupture, will cause profuse extravasation, rapid intense peritonitis, all the violent symptoms of such, and a quickly fatal issue. All grades between these two extremes may be met with.

The extravasation may be so profuse, and so quickly added to by the accumulation of peritoneal serous effusion, that it may be detected by the ordinary signs of fluid free in the peritoneal cavity, (See Case VII). Case No. IV was also an example of a posterior perforation, with very copious extravasation.

Case No. VI was an example of the favourable variety, one that would probably have recovered without operation, under careful medical treatment.

In any case in which the presence of free extravasation can be determined, plus the evidence of perforated gastric ulcer, the indications for immediate operation are absolutely imperative, and

the chances of success very small. I can say that with confidence after the experience of cases IV and VII. But it is rare, as has been pointed out, for the presence of free extravasation of fluid to be detected by physical signs. During operation, when free extravasation is found, it makes the procedure more tedious, as the cleansing of the peritoneum takes more time. Also it may be necessary to establish drainage lower down in the abdomen. And, further, the subsequent risks of general peritonitis, a localised abscess, or pyaemia, are much increased.

Having thus passed in review some of the more interesting symptoms, the diagnosis and differential diagnosis may now be considered.

THE DIAGNOSIS, as before mentioned, consists of two component parts, namely, "peritonitis plus perforation."

Every one of the symptoms is caused by the presence of acute peritoneal irritation, and commencing inflammation, or by the presence of air or fluid in the peritoneal cavity.

The mere fact, in itself, of an ulcer giving way, cannot be held to cause symptoms. Still it must be diagnosed: and it is diagnosed by its effects.

If we first then determine that the patient is suffering from acute peritoneal irritation, or inflammation, we must then seek the cause. I prefer to speak of acute peritoneal irritation, rather than of peritonitis, because it is just this very earliest stage that it is so important to recognise. The peritoneum has been chemically injured, and the symptoms are definite, and yet they are not at all the so-called classical ones of "acute peritonitis," for example, hard, quick, wiry pulse, pinched expression, temperature either raised to several degrees, or, in bad septic cases, sub-normal, vomiting, distended and painful abdomen, great prostration, and so forth. If we wait for these symptoms the best opportunity of saving the patient is lost. They are not the symptoms found immediately after perforation, at all.

The symptoms of this earliest stage, some, or all of which, may be present, are:-

1. Severe pain in the region of the stomach.
2. Pain spreading from that region, into other or all parts of the abdomen.
3. Pain perhaps in the thorax, either in front, or behind, and pain in the shoulders and neck.
4. Tenderness on pressure in some parts of the stomach region, and in other painful abdominal areas.

5. Relief to pain afforded by flexing the thighs on the abdomen. The patient may voluntarily adopt this attitude. Extension of the thighs inclines to increase the pain.
6. Very marked rigidity of the abdominal muscles, causing a board-like appearance, and sensation on examining by palpation. The rigidity in some cases may be localised and partial.
7. A condition of shock more or less marked, causing the pulse to be somewhat raised in frequency, the temperature being normal, or sub-normal, combined with
8. A facial expression of severe suffering, and apprehension, and of diminished vitality, indicated by a pallid and blueish tinge of the cheeks and lips.
9. Respirations of shallow and cautious character, either markedly or mostly costal in type, in many cases inducing pain in the upper part of the abdomen.

I purposely omit the symptom of "vomiting" in this list. It will, I think, occur if the stomach is full, but not after it is emptied, until the later stage of peritonitis sets in.

DIFFERENTIAL DIAGNOSIS: Some difficulty is apt to arise in making the diagnosis of acute peritoneal irritation, from the above symptoms, some or all of them, but especially when only some of them are present. Most difficulty occurs in the distinction between the partial and limited peritonitis of the less severe examples of perforation, from other conditions not peritonitis at all. In this

connection, from many authorities consulted, including, Fagge, Hemmeter, Martin, Osler, Dreschfeld, Fenwick, and many others, perhaps nothing so apposite and clear, and so authoritative, can be found as the paper by Treves in Allbutt's System of Medicine, Vol. III, p. 616. It seems necessary to quote a striking passage with reference to the diagnosis of peritonitis. "The signs of sudden and grave disturbance of the peritoneum are pain, profound exhaustion, a distressful anxiety, pallor, a small soft quick pulse, cold extremities, shallow respiration, and vomiting. The phenomena vary in degree, and are not absolutely invariable in character. They often mark the earliest symptoms of an acute and suddenly produced peritonitis, or rather indicate the occurrence of a lesion which will lead to peritonitis. It is important to note that, in some degree, these symptoms are common to all cases in which there has been a wide and abrupt impression made upon the nerve centres within the abdomen. It may almost be said that all quite acute troubles within the abdomen begin with the same train of symptoms. Until some hours have elapsed, it is almost impossible to say whether a sudden abdominal crisis is due to the perforation of a vermiform appendix, to the bursting of a pyosalpinx, to the

"strangulation of a loop of intestine, or to the
 "passage of a gall stone. The twisting of the
 "pedicle of an ovarian cyst has led to symptoms
 "which have been mistaken for peritonitis; a sudden
 "peritoneal haemorrhage has been confused with in-
 "testinal obstruction, and the rupture of a hydatid
 "cyst has been diagnosed as a perforation of the
 "intestine. It is quite possible, quite usual
 "indeed, for these various troubles to present, at
 "first, symptoms which are common to them all, and
 "which merely indicate that a shock has been com-
 "municated to the great abdominal nervous system.
 "To these common phenomena of a crisis within the
 "abdomen Gübler has applied the convenient name of
 "'peritonism.'"

And further, p. 617, "In perforative periton-
 "itis all the symptoms are usually acute and pro-
 "nounced. There is intense pain, and a correspond-
 "ing degree of collapse, and in the larger proportion
 "of cases vomiting is conspicuous; but it is usually
 "absent in examples of perforation of the stomach."

Also, p. 624 "Acute peritonitis does not always
 "follow a peculiar course. If certain symptoms are
 "insisted on as essential to a diagnosis, there may
 "be a difficulty in forming a correct opinion." .

. . . "A common train of symptoms ushers in

"most of the really acute lesions within the abdomen,
 "and for some hours at least it may not be possible
 "to say whether the case be one of renal or hepatic
 "colic, of perforation of the bowel, or of twisting
 "of an ovarian pedicle. In a little time, however,
 "differentiating signs appear, and the diagnosis can
 "usually be made within more or less narrow limits,
 "or indeed with absolute precision.

"It is hardly necessary to dwell upon the differ-
 "ential diagnosis of acute muscular rheumatism of the
 "abdominal wall, of acute pleurisy or pneumonia, or of
 "certain phases of hysterical mimicry. These affec-
 "tions are still mentioned by authors as conditions
 "likely to give rise to error in diagnosis: some also
 "add peritoneal haemorrhage and diabetic coma. The
 "haemorrhage may produce the symptoms of acute peri-
 "toneal damage which have been described under the
 "title of 'Peritonism.'"

Mr. Treves then passes on to consider the dif-
 ferential diagnosis between peritonitis and colic,
 and intestinal obstruction. I think it best to
 again quote his remarks on this subject. "The col-
 "lection of symptoms known as colic may be illustrated
 "by the colic of lead poisoning. In acute examples
 "this colic may bear some resemblance to peritonitis:
 "certain points of distinction, however, have to be

"noticed. The pain in colic is distinctly paroxysmal; the patient recognises it as a griping pain, it bends him double, he tends indeed to assume a position which is the very opposite of that assumed in peritonitis. There is, as a rule, no hyperaesthesia of the surface and no tenderness: often, indeed, the pain is relieved by pressure. There might be some collapse in severe colic, but vomiting is rare. There is no meteorism and no fever, although now and then cases of lead colic are met with in which there is tenderness of the surface, with inability to bear pressure, and fever. Intestinal movements take place in colic, and can often be perceived both by the patient and the medical man: the patient rolls about, and keeps his hand pressed to the abdomen. There is a total absence of the phenomena either of inflammation or of septicaemia: I think, however, that sometimes at the outset of peritonitis the pain may be, in fact, the pain of colic."

And further, in this matter of diagnosis, with relation to intestinal obstruction he says "In acute intestinal obstruction the symptoms at the outset are those of 'peritonism.' The pain is more of the nature of colic: the patient often enough is bent double. The pain is disposed (at first at

"least) to be paroxysmal. The abdomen is not tender, "nor is the belly-wall rigid and board-like. Meteorism appears early. Vomiting is an early symptom, is frequent, and very copious. It often gives a temporary relief, and in a little while in acute cases the vomited matter becomes stercoraceous. "Abdominal respiration is not inhabited at first. "There is no fever."

In addition to the distinguishing features of colic, and intestinal obstruction, as detailed in these extracts from Mr. Treves' article, assistance in coming to a right conclusion is found in the consideration of the history of the patient's previous health, the onset of the illness, and some of the other abdominal signs which may be present, and which are diagnostic of perforation of a hollow viscus in the abdomen.

From hepatic colic, associated with jaundice, the diagnosis is obvious, unless in some rare case one should meet with a perforating ulcer in a jaundiced patient. I have not heard of such. When there is no jaundice, the history of the patient, and often, though not always, the age and sex, increases the likelihood of gall-stones, on the one hand, and diminishes that of gastric ulcer on the other. The pain, too, is frequently

paroxysmal, and there is not the board-like rigidity of the abdomen. The site of the pain is often confined to the right hypochondrium.

Mayo Robson (Diseases of the Gall Bladder and Bile-ducts - Allbutt's System, Vol. IV, p. 237) states of the pain that it is paroxysmal "under the right costal margin, or in the epigastrium, whence the pain radiates over the abdomen and to the right scapula. These attacks come on suddenly, when the patient is quite well: and usually end by causing nausea or an attack of vomiting . . . on several occasions I have seen patients so profoundly collapsed by attacks of cholelithiasis as to lead to a difficulty in diagnosis: the case being more like one of perforation of some abdominal viscus, or some intra-abdominal haemorrhage: but the history of previous seizures, and of the onset of the present attack, will usually help us to arrive at a correct diagnosis."

The pain therefore in situation, radiation, and severity, and in the presence of shock, may in some cases of hepatic colic simulate the onset of peritonitis from perforation. No doubt time would develop differentiating symptoms, but the important point is to make the diagnosis without much delay. Such a case might be very puzzling. So far I have

not myself met with one which presented difficulty. Of the five cases in which I was instrumental in having the abdomen opened for perforation of the stomach, that lesion was found in all. In a difficulty of the above nature, apart from the history of the case, and the age and sex of the patient, I would place great importance on the condition of the abdomen on palpation, and a generally retracted, and rigid abdomen, would suggest to me the early stage of perforative peritonitis. Further, the pain of gall-stones at least usually starts in the right hypochondrium, and if it radiates, does not go so far beyond the epigastrium to the left side, as that of perforated ulcer may do, nor does it invade the abdomen quite so generally, as it does in marked cases of the latter affection. Also the abdomen is not generally sensitive to pressure, though there is often, in gall-stones, tenderness over the region of the gall-bladder, and just adjacent to it.

RENAL COLIC: This is to be distinguished generally by the history of renal and urinary disorders, and by the examination of the urine, and by the absence of gastric and abdominal history and indications. The pain, too, is confined mostly

to one side, in front or behind, and passes through the iliac region into the groin, testicle or thigh. The abdomen is not tender, retracted, or distended, or rigid, in the way that it is in the peritonitis of perforated ulcer, and even in the earliest stages of a case, confusion in this direction is unlikely, with due care, and examination. We have thus seen that the condition of early peritonitis, or peritoneal irritation, may have to be, and can be, distinguished by its symptoms from other acute abdominal conditions - and there have been considered chiefly the symptoms and distinguishing features of intestinal colic, intestinal obstruction, hepatic and renal colic. There are other conditions, such as acute gastric indigestion, hysterical affections, spinal and nerve pains, and muscular affections of the abdominal wall, the distinction of which is too obvious to require detailed consideration. As I have said, there are certain, and sure, on the whole, symptoms which indicate the presence of acute peritoneal irritation, that is, the earliest stages of acute peritonitis. Having, in any case, determined the presence of this acute peritoneal irritation by these symptoms, it must then be referred to its cause. This leads us to the second part of the diagnosis. In reaching the conclusion

that the early peritonitis is due to the rupture of a gastric ulcer, we carry the process of differentiation still further, and in doing so we derive great assistance in three directions:-

1. The past history of stomach function.
2. The duration, and manner of the onset, of the illness.
3. Some of the abdominal signs.

From the past history of the patient we may derive no assistance at all, but this is unusual. As a rule there are symptoms which point to previous gastric derangement, in some cases almost conclusive of previous gastric ulcer. In this connection the age, sex, and occupation, must be duly considered. In other cases the evidence is less definite. Even when the evidence obtained is not positive, it may be negative of other conditions, which can then be excluded.

The duration of, and manner of onset of, the illness is to be carefully investigated. The patients often describe this in graphic terms. They speak of the sudden occurrence of terrible pain in the abdomen (some special point in it), of the increase of this pain, and of its burning, agonising character.

Enquiry would naturally be made here as to what the patient was doing at the time, whether undergoing any muscular exertion, or not, and as to the quality and number of recent meals.

In all these ways, however, we only obtain a fair idea of the probabilities of the case. Suspicions may be raised, but nothing confirmed with absolute certainty.

Can we obtain absolute certainty?

In some cases this is possible, by a consideration of (3) - Some of the Abdominal Signs.

These are:-

- (a) Distinct diminution or absence, of the hepatic dulness, especially in the nipple line (very important).
- (b) The presence of free fluid in the peritoneal cavity (rare).
- (c) The occurrence of a curious tinkling bubble-like sound, in the stomach region (not by itself reliable).

Of these three, the first (a) is by far the most important and reliable. If it is made out with certainty - by no means always easy to do - then it is proved that an air-containing viscus has been perforated: and other signs and symptoms, along with the history, are sufficient to clearly indicate the stomach as the ruptured organ. We can readily exclude ruptured enteric ulcer, or

ruptured malignant ulcer of the bowel. But the sign may be absent in cases of gastric perforation. Its absence is no proof whatever that perforation has not occurred. Herein arises difficulty. With regard to the presence of free fluid (extravasation), it is rarely that we can detect its presence, soon after perforation. And any inference from the bell-like sounds, heard by the ear with or without the aid of the stethoscope, must be very cautiously drawn.

It is therefore in these cases where no alteration in the liver dulness can be detected that the differential diagnosis offers most difficulty.

In such cases, early peritonitis being diagnosed, we must fall back on the former history of the patient, the age, sex, occupation, and mode of onset of the illness, and all possible past experience, to establish the diagnosis of the seat of injury.

Having thus generally considered the diagnosis up to this point, I will now recapitulate and classify the details.

DIFFERENTIAL DIAGNOSIS OF THE CAUSE OF THE
PERITONITIS

A. PERITONITIS, accompanied by diminution or absence of hepatic dulness (at the very earliest stage only).

This must be due to the rupture of an air-containing viscus: and this must be either:-

- (1) Stomach
- (2) Duodenum
- (3) Small, or large intestine.

While it may be impossible to differentiate between a ruptured gastric and duodenal ulcer, we can readily exclude the presence of typhoid fever, tuberculosis of the bowel, and usually from the age and general state, and history of the patient, malignant disease of the small or large bowel.

B. PERITONITIS, associated with an unaltered hepatic dulness.

This may be due to:-

- 1. Ruptured gastric, or duodenal ulcer
- 2. Rupture in the small or large intestine
- 3. Appendicitis

4. Rupture of ovarian abscess, or pyosalpinx
5. Acute obstruction of bowels, with rapid peritonitis.
6. Gangrene of ovarian tumour, from twisting of pedicle
7. Puerperal peritonitis
8. Peritonitis occurring in association with other infective disorders, for example erysipelas, etc., etc.

In all these conditions it is obvious that the former history of the patient must frequently throw much light on the possible condition present, still more so the duration, and course, of the illness. The necessary physical examination is of the utmost importance, and may at once reveal the cause. Details of the differentiation in each case are not here necessary, but particular attention must be drawn to 3, 4, and 6. A ruptured gastric ulcer may cause severe pain in the right iliac fossa, also peritonitis there, and abscess formation. But evidence of pain and peritonitis in the gastric region will usually also be found in the case of stomach ulcer: on the other hand, in appendicitis a rectal examination may reveal a thickened appendix: and also in many cases a history of former attacks in the appendix region, with the absence of any history pointing to the stomach, will make clear the condition. The difficulty, however, is a real one, as I exper-

ience in Case I, and as many other have experienced. (See Middleton, Transactions of Glasgow Medico-Chirurgical Society, Vol. I, p. 50).

In Case I, I placed great reliance on the history of slight gastric disorder, and was not misled thereby. Ovarian abscess, and tumours, apart from the history, may be revealed by bi-manual examination, if necessary under an anaesthetic.

Acute obstruction of the bowels, with gangrene, or at least devitalisation of the bowel walls, apart from the evidence to be obtained by inspection and palpation of the abdomen, the vomiting, and mode of onset of the illness, only causes peritonitis after a certain interval of time, terribly short in the worst cases no doubt, but still not so absolutely immediate as after perforation: and the usual swelling and fulness of the abdomen in the former state is in marked contrast to the retracted and rigid abdomen of the latter. Error, indeed, in this particular direction, can hardly be conceived to arise. However, so far as differentiation from various conditions is concerned, the fact remains that in some cases where an operation appears to the physician and surgeon justifiable, exact diagnosis beforehand may be impossible.

The details, and varieties, of the treatment of perforated gastric ulcer are not within the intended scope of this paper, and only a brief summary will be added thereon, to complete the discussion.

The methods adopted in relation to sub-phrenic abscess vary so much with the conditions produced, that it suffices to say that usually it becomes a question of some carefully planned operative interference, the nature and extent of which is determined by the site of the abscess, its relations to neighbouring viscera, and the general and local conditions present in each case.

If surgical treatment be not adopted, then reliance must be placed on the "*vis medicatrix naturæ*" assisted by expectant and symptomatic measures.

In perforation into the general peritoneal cavity the treatment, also, must be either surgical or medical.

In any case where I was certain of perforation I would only consider the former, notwithstanding the fact that there are, and must be, some cases which would survive under medical treatment. Such medical treatment, briefly, is complete rest, rectal feeding, followed in time by careful oral

alimentation, the whole being assisted by the use of opium, freely, and internal (hypodermic or rectal) stimulation of the patient, according to the state presented.

But in many cases a fatal issue would not be averted by these means, in the very large majority indeed. It may be taken as a rule for the guidance of the general practitioner that in all these cases an operation must be at once conducted, with the aid of an experienced surgeon, if possible, on the lines laid down by abdominal surgeons, namely, laparotomy, followed by detection of the perforated ulcer, closure of it (after excision according to some, but this is strenuously opposed by others) by suture, perhaps with the aid of an omental flap: and further by a cleansing of the whole peritoneal cavity where it has been defiled, and in necessary cases by supra-pubic drainage of the pouch of Douglas, and other dependent portions of the peritoneal sac, with suitable after treatment, on the lines of the medical treatment sketched above.

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